PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO THE

STEAM ENGINE.

PART II.—A.D. 1860–1866,

(*in two volumes.*)

VOL. I.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
PUBLISHED AT THE
OFFICE OF THE COMMISSIONERS OF PATENTS FOR INVENTIONS,
25, SOUTHAMPTON BUILDINGS, HOLBORN.

1871.

PREFACE.

The Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to this series of abridgments have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent and be supplied in second or supplemental editions.

The inventions relating to the "Steam Engine" are so numerous that it has been found necessary to publish the Abridgments in two parts, and further to divide each part into two volumes. Part I. extends from A.D. 1618 to A.D. 1859. Part II. carries the subject on from the beginning of 1860 to the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological and Descriptive Index" (*see* List of Works at the end of Vol. II. of this Part). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

This series embraces the inventions relating to every description of motive-power engine actuated by steam alone or by steam commingled with other aeriform fluid; but not engines worked by air, gas, or vapour (other than steam): these will form the subject of another series of Abridgments. It comprises all matters relating to steam boilers and steam generators, including every description of tubular and other apparatus for producing, superheating, or regenerating steam; inventions for preventing incrustation; boiler furnaces; apparatus for feeding furnaces with fuel, for supplying air to furnaces, for the prevention and consumption of smoke, and for cleaning flues, tubes, and boilers; safety valves and safety apparatus; steam and water gauges; cocks and valves applicable to steam engines; and (besides the gearing and mechanism of the steam engine) indicators and all such attachments and separate instruments as are to

be used in connection with steam engines, whether locomotive, marine, or stationary.

It has been found expedient to include in the present series steam hammers and such like inventions, wherein steam is the motive-power acting in cylinders forming parts of these machines, as, for example, steam pile drivers, stone-crushing machines, steam rams, presses, brakes for locomotive engines and railway carriages worked by steam, excavators, agricultural implements, cranes, &c.; such as do not appear in the body of the work will be found in the supplement.

In the commencement of the first volume of Part I. the principal facts and incidents relating to the early history of the steam engine will be found chronologically arranged in the form of historical notes.

The Abridgments marked thus (* *) in the following pages were prepared for another series or class, and have been transferred therefrom to this volume.

B. WOODCROFT.

November, 1871.

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

[redacted]

THE STEAM ENGINE.

1860.

A.D. 1860, January 3.—N° 8. (* *)

HARDY, THOMAS.—"An improved tool for cleaning the inside "of the tubes or flues of tubular steam boilers."

This tool consists of a metal rod with a circular plate attached to the end of it; to this plate are attached a number of metal springs carrying scrapers on their outer ends which are pressed against the sides of the boiler tube by the elasticity of the springs; in order to pass the scraper clear of a ferrule or other obstacle, a sliding ring is made to come over the springs and hold them together when desired.

[Printed, 6d. Drawing.]

A.D. 1860, January 3.—N° 9.

JOHNSON, JOHN HENRY.—(*A communication from Nicholas François Corbin-Desboissières.*)—This invention relates to the construction of boiler and other furnaces and fire-places producing perfect and economic combustion of fuel and consuming the smoke. The furnace is divided longitudinally into three, the two side divisions are fitted with fire-bars, but the central division is a fire-brick dead surface, whereupon the fuel is introduced through a shallow cast-metal box opening, which narrows inwards and extends the whole width of the furnace; the lower side forms a dead plate above the level of the furnace bars; lateral abutments for operating with the poker and rake are cast in the box, and a roller is fixed opposite the central opening upon which the shovel-handle rests and rolls inwards at the time of feeding. The green fuel being deposited upon the dead surface remains there during distillation and becomes incandescent; it is then broken up and distributed on either side by the attendant, who again repeats the charge of green fuel on the dead surface.

The lower part of the fire-box of a locomotive requires lengthening out, so as to extend under the foot plate. In domestic grates the position and form of the dead surface is considerably modified.

[Printed, 1s. Drawings.]

A.D. 1860, January 3.—N° 16.

NEWTON, ALFRED VINCENT.—(*A communication from Charles Auguste Schultz and John Hauck.*)—(*Provisional protection only.*)—

"Improvements in the cut-off motion and slide valves of steam "engines" relating to the use of a duplex cam, adjustable by a V-shaped yoke attached to a sliding sleeve on the cam shaft, for operating the slide valves of steam engines, by means of a tappet rod connected with the valve stem by a clutch, whereby the steam can be cut off at any desirable part of the stroke. A "forked "pointer," in connection with the yoke and the governor, is made to indicate on a fixed graduated scale that part of the stroke at which the steam is cut off, as regulated by the action of the governor on the yoke, and the consequent varying adjustment of the face cams.

Also the balancing of slide valves by the use of a flat plate supported on four hollow columns, which rise from the back of an ordinary slide valve; a cap which moves freely up and down is fitted steam-tight over the plate; the columns are made hollow to contain springs, which force the cap up against the cover of the valve-box, and the slide down on its seat. "If, therefore, the "area of the plate is made equal to the superficial area of the "valve, the latter will be perfectly balanced, no steam being "allowed to come between the cap and the plate, or between the "cap and the cover of the steam chest."

[Printed, 4d. No Drawings.]

A.D. 1860, January 4.—N° 19.

GRIMALDI, PHILIPPE.—(*Provisional protection only.*)—

"Steam generators not liable to bursting." These boilers "do "not generate steam in the interior," they are "entirely closed," and "always quite filled with water," and they are made strong "enough to resist the pressure of steam due to the degree of heat "to which the liquid is raised." A large cast-iron cylinder which penetrates downwards through a stuffing-box on the top of the

boiler acts as a safety apparatus; it "is perforated lengthways "with a central hole closed by means of a stop-cock, and has half "its length plunged in the water on which it bears." Any excess of water pumped into the boiler causes the cylinder to rise until the cock is opened by the action of a small lever, which catches a stop, and as the surplus water flows out the cylinder descends until the cock is closed by contact with another stop. The boiler is cylindrical, and has "an internal furnace composed of two "rectangular chambers," and two flues which run through its whole length with water space between. The boiler may be set on masonry with external returning flues to increase the heating surface. Two feed pumps are used, one is for the ordinary feed, the other is fixed within the boiler, for the purpose of forcing the heated water into a vaporizing tube and onward, during conversion into steam, through two tubes in each of the internal flues to a "common receiving pipe," and thence to the engine.

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 4.—N° 22.

THOMAS, Edmund.—(*Provisional protection only.*)—Self-acting water guage and feed regulator for steam boilers. A float is suspended by a short connecting rod from a piston, which is fitted to work steam-tight in a perforated socket within the boiler at the lower end of a vertical tube, which is fixed downward through the top of the boiler, leaving a portion projecting above, through which the piston rod ascends, and to which a whistle is attached: regulating valves fitted in suitable cases to the feed pipe are worked by means of slide rods, levers, and connecting rods which are jointed to the top end of the piston rod; these valves descend and gradually lessen the water supply as the float rises, and open when the float falls. If the water is below its proper level in the boiler, the float will draw the piston below the perforations in the socket, when the steam will escape up the vertical tube and sound the whistle.

[Printed, 6*d*. Drawing.]

A.D. 1860, January 4.—N° 25.

WALLS, Joseph.—This invention relates to working high and low pressure steam engines with the same steam, the said engines having no connection as regards gearing or the direction or

application of their power. The exhaust steam from the high pressure cylinder is received into an intermediate chamber, from whence the low pressure engine is fed; a self-regulating valve is employed to adjust the high and low pressure valves for varying the expansion, which maintains uniform pressure of steam to the low pressure engine, by opening more or less according to the pressure of the exhaust steam.

Working the piston rods of high and low pressure engines at right angles on one crank, so that when the steam is acting with full power in the cylinder of one engine, the crank in relation to the other shall be turning the centres. Pumping water into a separate boiler, through the tubes and flues of which the hot draught from high pressure boilers passes on its passage to the chimney; and blowing the exhaust steam from high pressure engines into such boiler, for supplying low pressure steam to condensing engines.

Cleaning the flues of boilers with brushes fixed to an endless chain or chains, which work round drums in the chimney flues.

[Printed, 1s. 4d. Drawings.]

A.D. 1860, January 5.—N° 37.

GÖSSELL, OTTO JOHN THEODORE.—(*A communication from Louis Stössger.*)—"Supplying the fire-places of locomotive engines "with air to support combustion, and enable them to burn coal "without giving off smoke. To this end the engine is fitted with "a bent tube or air channel, which extends from the back of the "engine to the centre of the grate, and stands up above the grate "bars, thereby forming a heating chamber for the incoming air. "This air tube at the parts exposed to the fire is either covered "with or composed of fire-clay, and it is covered at top with a "shield, for the purpose of preventing the coals when carelessly "thrown into the fire-place from entering the air channel. The "air tube passes down through the ash-pit, and its outer and "lower end is closed by a valve or damper, which is operated by "a rod to regulate the supply of heated air to the fire, or to cut "off the supply when required."

"When applying the invention to locomotive engines already "constructed, it is proposed in order to impart strength and "firmness to the fire-boxes, and increase the heating surface, to "apply double walls thereto made of copper, one being situate

" on either side of the central air supply tube or channel. This " tube is provided at top with a small cylinder of fire-clay, to " assist in raising the temperature. The stiffening walls slant in " height from the back of the fire-box towards the tube plate, and " the space which they enclose is covered in."

[Printed, 1*s*. 6*d*. Drawing.]

A.D. 1860, January 6.—N° 42.

MOY, THOMAS.—"Improvements in steam engine governors." The invention relates to that kind of governor which is made to act on the "throttle valve through intermediate mechanism " whenever the resistance to the action of the engine becomes " diminished, and thereby prevents an acceleration of the speed " of the engine, as distinguished from governors which are made " to act on the throttle valve by such acceleration of speed." "It " consists in adapting and applying to the ordinary working shaft " of the engine a disc, with which is combined a ring fitted thereto " in such a manner as to admit of the ring sliding between guides " over the surface of the disc to an extent limited by a slot in the " disc, through which the crank pin or drag link connected to " the ring is passed, and by a space terminating in a shoulder " formed in the ring. To the disc is also fixed a spring or springs " for resisting the motion of the ring over the surface of the " disc and stops, which respectively form an abuttal in one direc- " tion, while the ring is moved against the spring in the opposite " direction. By this arrangement the tendency of the spring or " springs is to close the throttle valve by bringing the ring into " its middle position on the diminution of the resistance to the " engine, and the valve is opened by the sliding of the ring to " either side of such position (on either the forward or the back- " ward movement of the engine), by the compression of the spring " or part of the spring in connection with the ring on such side." " The motion of the ring is communicated to the throttle valve " as required by means of a flange or grooved pulley, to which " is imparted a horizontal motion on the periphery of the disc by " a stud on the ring working in an inclined or spiral slot or groove, " but it may be otherwise communicated."

Various modifications are shewn which act on the same principle.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1860, January 7.—N° 49.

BOULTON, James Bowyer D'Arcey.—This invention relates principally to slide valves working under high pressure, such valves being so fitted and applied that they work in equilibrium or nearly so, without variation throughout their movement. An opening is formed in the slide case about equal in size to the area of the face of the valve; it is closed by a plate attached to the back of the slide valve; the opening is packed round by a suitable packing pressed by a gland upon the flange of an inner ring, which works upon and keeps the plate steam-tight, and forms the inner side of the stuffing box; the usual valve rod and stuffing box are not required, as the slide is actuated by means of an arm fixed to that part of the plate which is seen through the opening. The varying pressure on the slide valve as it works over the induction ports is provided for by lengthening the valve at each end, through which openings are cut to suit the position of the induction ports, and forming circumscribed sunken spaces of the same size as the ports in the valve seat beyond, to which the steam is admitted at the proper time; when the valve is about to open an induction port the steam in the circumscribed areas is exhausted through a small passage in connection with the waste port.

"At the moment of covering an induction port the steam is " again admitted to the circumscribed area to compensate for the " increase of pressure to which the valve face would otherwise be " subjected."

[Printed, 10*d.* Drawing.]

A.D. 1860, January 7.—N° 53.

MORELAND, Richard, junior.—(*Provisional protection only.*)—Condensing apparatus for high pressure engines.—The exhaust steam is conveyed from the engine towards the chimney by an outlet pipe, to which, by a branch pipe near the engine, a condensing vessel is so attached that a part of the exhaust steam may rush therein; a regulated quantity of condensing water, divided within the condensing vessel into numerous jets, is supplied from a cistern through a pipe attached to one end of the condensing vessel, out of which the boiler is supplied with hot water by the ordinary feed pump.

[Printed, 4*d.* No Drawings.]

A.D. 1860, January 13.—N° 98.

EUNSON, JOHN.—(*A communication from Robert Groat Eunson.*) —This invention is for cooling liquids.—A refrigerating apparatus or "decalorator" is described as applied for the purpose of cooling the condensing water of marine engines; it consists of a long quadrangular casing internally flanged round within a short distance of each end, where small chambers are formed by tube plates fitted against the flanges; the chambers communicate with each other through a group of numerous small tubes fitted quincunxly into the tube plates; a series of transverse metal diaphragms perforated for the tubes to pass through are disposed equidistant along the tube chamber and fixed alternately to opposite sides leaving side channels for the passage of the cooling water which is thereby made to course laterally between the tubes in each succeeding division. The apparatus is fixed fore and aft to the side of the vessel below the water line, communicating by short tubular bends with the sea water, which, when the vessel is moving forward, enters the fore end of the tube chamber, and after coursing from side to side through each succeeding division, passes out again by the passage at the after end. These passages are closed by valves when necessary. The water from the hot well is raised into the after-end chamber whence it passes through the tubes into the fore-end chamber and thence in a cooled state to the condenser. A conducting hood is so fixed outside the vessel over each passage that the sea water shall enter and leave freely. The decalorator is applicable to all purposes for cooling liquids.

[Printed, 10*d*. Drawing.]

A.D. 1860, January 14.—N° 105.

COFFEY, JOHN AMBROSE.—(*Provisional protection only.*)—This invention relates to economizing power in connection with steam engines and other motive mechanism. It consists in applying power at such a distance from the centre of the object to be set in motion as will afford the greatest force of leverage compatible with the effect to be accomplished, as in the case for example of the application of the power of a steam engine to move paddle wheels; instead of as usual employing a crank connected to the paddle shaft, the extreme radius of which crank is considerably less than the radii of the paddle wheels, a large tooth wheel of equal

or greater diameter than the paddle wheels is keyed upon the paddle shaft, and actuated by another toothed wheel which receives motion from an engine much smaller than the size of engines ordinarily employed. Other arrangements of the same nature are included in the invention.

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 17.—N° 114.

GREW, NATHANIEL.—(*Provisional protection only.*)—Improved pressure and vacuum gauges. A series of counteracting weights is so arranged and set on the end of a piston rod that as pressure increases the weights are separately taken up, whereby their accumulating weight is made to act against the rising pressure of steam, water, gas, or other fluids. The piston works in a tube which is provided with an escape to blow off at any maximum pressure. "The end of the piston being continued above the " weights, and provided with a suitable rack and pinion or worm " wheel, gives motion to an index on a dial, and indicates the " pressure or vacuum within the boiler or other vessel." A very fine spiral or other form of spring may be attached to the piston if found necessary.

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 17.—N° 119.

RUCHET, DAVID FRANÇOIS LOUIS, VONWILLER, JACOB, and SEILER, FREDERICH.—This invention relates to a rotary machine, which will operate either as a steam engine, water wheel, or pump, and will transmit power to a distance. It "consists of " a machine or engine composed of a bucket or float wheel, or of " an endless chain carrying buckets or floats, which wheel or chain " is enclosed in a case containing water, mercury, or other liquid, " and caused to revolve therein by some moving fluid, such as " compressed air, water, or steam, admitted through a pipe car- " ried, by preference, to the lower part of the case. A pinion is " placed above the bucket or float wheel and is geared into " thereby; the pinion is mounted on a shaft working in bearings " formed in the sides of the case, and from this shaft rotarory " motion is transmitted." "The machine may be employed " for the production of compressed air by reversing the " motion of the bucket wheel or chain, whereby air will be

"drawn into the case, a portion of which will be taken "into every bucket as it rises during the revolution of the "wheel or chain just clear of the liquid. The air in each bucket "will become compressed according to the density of the liquid "through which the buckets take it, and on the buckets reach-"ing the lower part of the case the compressed air issues through "apertures provided in the sides thereof into a pipe or pipes, and "thence for use, or into a receiver. By attaching a pipe to the "upper part of the reservoir the machine acts as an exhaust "pump." When employed as a rotary engine mercury as the liquid in the case is used in a heated state, in order to prevent the condensation of the steam. After use in the engine the steam is conveyed to a condenser, where any particles of mercury sublimated by the heat of the steam may afterwards be collected. A modification of the apparatus for compressing air is exhibited and described, wherein the bucket or float wheel is replaced by a tubular coil.

[Printed, 8*d*. Drawing.]

A.D. 1860, January 17.—N° 120.

SPENCER, John Frederick.—This invention relates to improvements in steam engines for propelling ships, and for other purposes. "It also refers, more or less, to further im-"provements upon and modifications of the inventions previously "patented by me on the 16th of November 1857, and numbered "2874, and on the 29th of March 1858, and numbered 661." All the several parts of the present invention relate to surface condensing steam engines, as described in the patent of 1857. The 1st part consists in placing the case of a surface condenser on two chambered legs fixed to the bed plate in a position to form a fixed support for the inner sides of two inverted cylinders between their vertical centres, whilst the forward and aft portions of the cylinders rest upon columns or framework secured to the bed plate; this arrangement is for screw propulsion, the cylinders being fore and aft and the crank shaft in a line with the keel. The metal tubes in the condenser, through which the water is mechanically driven, are placed horizontally across the line of the keel, so that they may be examined, cleaned, or repaired by the mere removal of the side cover plates of the condenser case without deranging the other *parts*. Fixed to the condenser case

are the two inner slides for the crosshead to the piston rod of each cylinder; these cylinders are shown with double shells and hollow covers for the purpose of surrounding them with steam. 2nd part relates to paddle-wheel engines. A pair of oscillating cylinders are shewn working upwards on the main crank shaft; the surface condenser is placed between the exhaust trunnions of the cylinders, and is intended to form a support for the main shaft; the tubes in this arrangement are horizontally placed in a line with the keel, so that easy access may be gained to them without disturbing any of the general fittings. 3rd, in horizontal engines for propelling war vessels, the case of the surface condenser is arranged to form the central framing or support for the engines of such vessels, and must be kept below the water line. 4th part relates to the use of one or more cut-off valves at the same time that the main slide is relieved from the pressure of steam. The cut-off slide or slides work in a rectangular chamber "formed by surrounding the back of the main slide with "a supplementary back and sides, the supplementary back "being fitted with the faced ring" ordinarily in use "for "relieving the back pressure, the supplementary sides and ends "being perforated with apertures of any convenient size or form "to admit the steam freely to the cut-off slides."

[Printed, 1*s*. Drawing.]

A.D. 1860, January 18.—N° 129.

CHAPLIN, ALEXANDER.—This invention, relating to engines for drawing or conveying heavy loads, consists (1) in applying to self-propelling traction engines, mechanism for hauling forward the load by means of a rope or chain. A winding barrel is mounted upon the main axle, or is actuated by the driving wheels. When, in consequence of the hilly state of the road, the engine is unable to draw its load, it is moved on in advance, and the driving wheels, by means of crutches or otherwise, are raised from the ground. The winding barrel is then set in motion by the wheels, when the rope, which is attached thereto and to the load at its other end, hauls the latter up to the engine; again, if necessary, the engine may go on another stage in advance, and again haul the load towards it, and continue to do so until the difficulty is surmounted. The winding barrel may be mounted on a separate axis, and at the required time be brought into activity by suitable

appliances, thereby avoiding the necessity for raising the driving wheels when the barrel is operating alone. The invention also relates to the construction of engines for either traction, hauling, or carrying loads. The frames of these engines are made considerably longer than the ordinary length, in order to make space for carrying the load upon one end of the frame and to dispose at the other other end of the engine and boiler, which by preference are arranged and constructed according to the plans described in the Specifications of prior Letters Patent which had been granted to this inventor, and bear date respectively December 26th, 1857, No. 3165, and April 7th, 1859, No. 866.

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 21.—N° 155.

BELLEVILLE, Julien François.—Generating steam. Two longitudinal pipes connected by shorter tubes at their ends form the rectangular foundation of the apparatus. A close range of vertical tubes is fitted in line along each longitudinal pipe, these after forming the upper sides of the ash-pit, and the vertical sides of the furnace are bent over towards each other to form the roof of the furnace; they are then turned back by a sharp bend, reaching horizontally a short distance beyond the width of the furnace, when they are turned upwards and bent back again towards the centre, then again turned upwards and bent back outwards, and after continuing their horizontal course a length corresponding with the bend below, they are turned back again towards a central longitudinal pipe, into which, in a series of holes along its sides, the ends of each series of tubes are fitted. The lower part of the apparatus generates, while the upper superheats the steam, which rises into the central longitudinal pipe and passes therefrom to the "level maintainer," which is fitted to the front of the apparatus over the furnace door; the sides, end, and top of the apparatus are encased in brickwork, through which, dust, and other openings give access within. Other superheating tubes may be introduced horizontally outside each range of generators. The "level maintainer" is a covered vertical cylindrical vessel, in which a float is suspended from an external lever, which operates on the feed cock to open and shut off the supply of water; the upper part of the vessel is filled with steam which communicates *by a pipe with* the engine, and the

lower part with water at the working level on which the float rests, and from which a pipe descends and forms a communication through a stop valve with the longitudinal foundation pipes. This part of the apparatus is self-acting. A "pressure regulating "apparatus" consists of a rod or piston charged with weights or springs, one end is open to the steam pressure, the other is connected to the handle of the feed cock, which, as soon as the pressure exceeds the maximum intended, closes and shuts off the feed water.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, January 21.—N° 161.

BEVIS, Restel Ratsey.—(*Provisional protection only.*)—Combining in marine engines a high-pressure cylinder with a larger sized low-pressure cylinder to work together on "Wolff's" principle, the steam acting first on the high-pressure cylinder expansively, and exhausting into the low-pressure cylinder. "These cylinders I connect with a crank or cranks on the main "shaft in such a manner that the pistons of the two cylinders "may not be at the ends of their strokes; at the same time I "prefer so to arrange them, that when the engine is working "forward the piston of the low-pressure cylinder may be at the "end of its stroke one-sixth of a revolution or thereabout before "the piston of the high-pressure cylinder is at the end of its "stroke." To overcome the difficulty of starting when the high-pressure piston happens to be at the end of its stroke, steam is admitted to the low-pressure cylinder direct from the boiler by opening a communication between them made for that purpose, which is closed (when the pressure of the steam in the valve box is uniform with its usual working pressure therein) by a regulating valve, the use of which will regulate the working pressure at all times upon the low-pressure cylinder.

[Printed, 4*d.* No Drawings.]

A.D. 1860, January 24.—N° 172.

GUFFROY, Charles Constant Joseph.—An invention for consuming smoke, and feeding furnaces with fuel. Between the furnace bars a number of long narrow open troughs supported by hollow cross bearers are fixed, so that the bars, which are divided into groups, and the top edges of the troughs are level; the fore

ends or mouths of the troughs expand and project forward beyond the furnace doors; the door plate has a small opening over the mouth of each trough, to which separate furnace doors are fitted; the troughs incline to shallowness towards their inner ends, and each is furnished with an "elevator," which is a long narrow metal plate corresponding with the length and width of the trough, rounded at the outer end to form a handle. When starting the furnace the elevators are laid along the level bottoms of the troughs, which are then filled with fuel; the process of distillation goes on before it is raised to the fire, which at the proper time is effected seriatim by the attendant, who first pushes an elevator to the shallow end of a trough, and then raises the handle to a level with the furnace bars, thereby lifting the feed; in this position the handle is suspended by a hook, whilst a charge of fresh fuel is thrown into the trough under the elevator, which is then withdrawn and thrust under the new charge along the bottom ready for the next lift. The apparatus is applicable to all kinds of furnaces and fire-grates. All clinkers are pushed over the bridge into a receptacle, which is daily emptied through a door opening at the end of the ash-pit.

[Printed, 1s. Drawings.]

A.D. 1860, January 24.—N° 178.

HARRINGTON, Timothy.—" Improvements in steam engines " and boilers," relating to a mode of surface condensing exhaust steam at the highest possible temperature, and forcing the water thus produced into contact with new steam to be re-converted, and thence through a generator on its way to the engines; the condensers are constructed either to pass the cold water through all the tubes in one direction, or to pass through one-half the tubes into a chamber, and return by the other half. The tubes are set parallel in groups, and fitted into a chamber which receives the exhaust steam; an india-rubber packing provides for expansion, or the easy removal of a group of tubes, when required for cleansing or repairs. When used for marine purposes, the mouth of the cold water inlet pipe must project and open towards the stem of the vessel, and the outlet must project and open towards the stern, so that when the vessel is under way the pressure against the mouth of the inlet pipe, and the partial vacuum formed at the mouth of the outlet pipe, will keep up a constant

current of water through the condenser without pumping. Self-acting and other valves are provided to regulate the water supply, and for changing the direction of the mouths of the pipes when the vessel is going astern. One modification forms a stop valve when required. A donkey engine is used to force the water through the condenser when there is no speed on the vessel. From the condenser the hot water is forced in fine jets into a chamber in connection with the steam room of the boiler, where it is partially re-converted by contact with the rush of steam from the superheater; the chamber opens into the tubes of the generator, which is heated by a separate furnace underneath in the centre of the boiler, and the remainder of the water is therein converted, and the steam on its passage to the engines is thus raised to a high temperature. All the furnaces discharge into the chimney through the same flue; the superheater, through which the steam passes from the boiler to the chamber, is formed with two end chambers connected by a group of tubes, it is placed either in the flues or at the foot of the chimney.

[Printed, 1s. 2d. Drawings.]

A.D. 1860, January 24.—N° 179.

CARTER, JOSEPH THRELFALL.—Engines and boilers for driving agricultural implements. A single or pair of engines and cylindrical tubular boiler are mounted on travelling wheels across a frame which is supported on four broad wheels and a central front guiding wheel; the boiler is fired at both ends in furnaces beneath; the hot draught enters the boiler above each furnace through fire tubes, which within are bent down to pass out horizontally at the opposite ends; two other ranges of horizontal tubes, which slightly incline upwards, extend from end to end of the boiler; all the tubes open into heat chambers at each end of the boiler, which have partitions to return the hot draught through the upper ranges of tubes into their upper compartments, which open into external casings along the top, within which two large superheating steam tubes, extending the whole length of the boiler, are placed. These tubes, which supply the cylinders, receive steam from the upper part of the ends of the boiler through bent tubes within the heat chamber; the chimney is placed mid length on the boiler between the casings which communicate therewith. The water tank is placed under the boiler at the back

of one of the furnaces, and a "fan blower" is placed at the back of the other, in connection with a case, into which the exhaust steam and cold blast are conveyed; the water produced by condensation runs back into the tank to be again pumped into the boiler.

The bodies of the engine cylinders are sunk through the top of the boiler between the casings on each side of the chimney; they are supported by their top flanges upon the boiler plates, to which they are rivetted. Each piston rod is attached to a crosshead, which through external connecting rods actuate separate crank shafts below, upon which are toothed wheels geared into a wheel on a central shaft, from which a pair of bevel wheels give motion to a worm shaft, which drives a worm wheel fixed on the main axletree, whereon are the four broad supporting wheels. Bevel gearing upon intermediate horizontal shafts gives suitable motion to a variety of agricultural cultivating implements, which are explained in the series of Abridgments devoted to that subject.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, January 24.—N° 182.

BARRANS, Joseph. — (*Provisional protection only.*)—"Improvements in steam boilers." Conical hollow hanging water spaces or cells, closed at their lower ends and communicating with the water in the boiler, are fixed to the roof of the furnace or the bottom of a boiler which is heated by a fire underneath, for the purpose of obtaining an increased amount of heating surface. The hollow descending water spaces may also be arranged in concentric rings, and so tapering downwards that the openings of the heating spaces shall increase in width towards the fire. Also encasing the steam chamber, and opening thereto a communication with the smoke box or flues of a boiler, in order that the products of combustion may pass round the steam chamber, through, and in which if desired, tubes may be fitted to increase the heating surface.

[Printed, 4*d.* No Drawings.]

A.D. 1860, January 28.—N° 229. (* *)

LANGEN, Eugen.—"Improvements in steam boiler and other "furnaces." "For these purposes a series or succession of sets "of fire-bars is employed, one below the other, the lower sets or

" series projecting more and more into the fire-place or furnace, " so that the surface of the burning fuel inclines from the upper " to the lower parts of the interior of the furnace. It is preferred " that the fire-bars at their inner ends should be bent or formed " with elbows, so that their inner ends may incline from the " horizontal line downwards, and so that their lower ends may " come within a short distance of the horizontal parts of the set " or series of bars next below them, leaving, however, a space " to admit of coal being pushed forward between the inclined " parts of the upper set or series of bars and the horizontal " parts of the set or series of bars next below them. In front " of each set or series of bars is fixed a horizontal dead plate on " a level with the horizontal parts of the fire-bars. At the end " of the furnace nearest the bridge there is a set of ordinary fire- " bars, which are preferred to be horizontal, but this may be " varied. This set of fire-bars is at a lower level than the " ends of the lowest of the sets or series of fire-bars before de- " scribed, and between them there is a vertical set of fire-bars " mounted on axes, so that they may, when desired, be opened " outwards into the ash-pit."

[Printed, 10*d*. Drawing.]

A.D. 1860, February 1.—N° 257.

HARTLEY, WILLIAM.—" Improvements in steam engines."

1. Relates to a mode of regulating the traverse of the cut-off or expansion valve. A lever vibrating on centres near the lower end receives motion from an excentric rod which is jointed to its side; on the opposide side the cut-off valve connecting rod is jointed to a movable block, which, by means of a screw fitted in a central groove along the lever, is made to traverse to and from its centres of vibration, on which are two loose bevel wheels, one on each side of the lever, which gear into a third bevel wheel fixed on the end of the screw; two ratchet wheels with teeth right and left are fixed to each loose bevel wheel, and catches to act in either direction are fixed to the frame; a projecting stud in each catch rests upon a lever which is actuated by the governor by means of a connecting rod; the vibrations of the vibrating lever keep the two bevel wheels in neutral action while the engine is working at its proper speed, as the catches are then kept clear of the ratchets; but if the governor falls or rises, then those catches

which act on the ratchet wheels in the direction for regulating speed are brought into action, and the traverse of the cut-off valve connecting rod is increased or diminished by the rise or fall of the movable block, which is actuated by the screw then set in motion in the right direction by the bevel wheels.

2. A mode of working exhaust slide valves, by connecting the valve rod to a lever or levers in a way to receive motion from two excentrics set at different angles, but so that their action at certain parts of their revolutions and traverse increases, and at other parts diminishes the ordinary motion which is communicated to exhaust valves when they are connected singly and direct.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, February 1.—N° 258.

HILL, THOMAS.—Steam boilers.

This invention relates to a mode of joining the plates or divisions of the flues or fire-tubes of boilers by means of circular or partially circular hollow bars, so that when rivetted between the plates or divisions, additional heating surface and increased strength of the flues is obtained, and also freedom for expansion and contraction. The plates which form the hollow bars are turned up to a right angle along each side to form flanges about two inches broad, to which the divisions of the flue are to be rivetted; their centres are then bent back longitudinally in the form of an arch about three inches high by two inches wide, which brings the flanges, then projecting at each side from the base, down to a level with each other. These hollow bars are rivetted between the divisions and thus form the boiler flue, shewing between the divisions a series of annular ribs or rings, projecting either inwards or outwards according to the way the hollow bars are turned and jointed. The hollow bars may be used in the ends and other parts of a boiler.

[Printed, 8*d.* Drawing.]

A.D. 1860, February 2.—N° 268.

INGHAM, WILLIAM, and HINCHCLIFFE, WILLIAM.—(*Letters Patent void for want of Final Specification.*)—This invention relates to "apparatus for applying steam and other vapours, gases, " or fluids to the production of motive power, and which may " also be used for a pump or gas exhauster or other similar " purpose."

"Within a hollow cylinder is placed a solid cylinder or roller "of less diameter, so that at one point the circumferences of the "two cylinders shall touch. The steam or other vapour, gas, or "fluid is let into the space between the two cylinders at one side "of the point where they touch, and is allowed to escape at the "other side of that point. The steam or other vapour, gas, or fluid "drives a lever or piston which is attached to the inner cylinder, "and the power is generated by the revolution thus occasioned of "the lever and the cylinder to which it is attached; the outer cylin-"der is fixed. The lever or piston is attached to the revolving "cylinder in such a manner as to adapt its position in revolving "to the varying width of the space between the cylinders, and "thus to work steam tight in that space. In cases in which the "force of the vapour, gas, or fluid consists of weight or pressure "rather than force of expansion, the invention may be varied by "making the cylinders concentric, and arranging the admission "and escape of the vapour, gas, or fluid at such points as will "secure the greatest amount of power."

The invention may be modified by keeping the cylinder to which the piston is attached stationary and allowing the outer cylinder to revolve and give off power. When used as a pump the axis whereon the inner cylinder is fixed is driven by power from another engine.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 2.—N° 270.

YULE, JOHN.—(*Provisional protection only*.)—A mode of increasing the steam room and superheating steam by fitting steam spaces constructed of thin metal within the water spaces of the boiler, such spaces opening only into the steam chamber above the water level; the flues may be made to pass through such steam spaces. Also fixing a vertical partition near the end of an ordinary cylindrical boiler to form a steam space, and for superheating the steam by fitting therethrough a number of tubes, which form a passage for the hot fire draught between the flues and the chimney.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 2.—N° 272.

REDRUP, GEORGE.—(*Provisional protection only*.)

This invention relates to "the means of and apparatus for obtain-"ing and applying motive power whereby perpetual motion may

"be obtained." It consists of cylinders with pistons actuated by simple or compound levers; elbows are attached to each end of the smaller cylinder to which two large cylinders are fixed; the piston rods of the large cylinders are jointed to levers, which have fulcrum bearings cast to the cylinder covers. A weight in a fixed or movable position is attached to the long end of each lever; the piston rod of the small cylinder gives off the motion generated; simple or compound levers which are actuated by the machinery when in motion are employed, their short ends are placed close to the weights on the levers attached to the cylinder, so that a small weight applied at the long end of the under lever will raise both the weight and lever attached to the cylinder, which removes the pressure from the cylinder piston. An open communication or water passage exists between the two large cylinders and the small cylinder, which is filled with water or other fluid, including the water passages and the space up to the piston in each large cylinder. The levers, weights, and pistons alternately force the water and piston of the small cylinder in opposite directions, the traverse increasing in proportion to the difference in the area within the circumference of the small and large cylinders respectively, which, assuming it to be one-sixth, the small piston will move six inches, while the large pistons make only one inch of traverse. This appears to be the advantage calculated upon for actuating the machinery which is to operate the levers, weights, and pistons, and thereby generate perpetual motion. The inventor states that his invention may be applied to all steam engines now in use.

[Printed, *4d.* No Drawings.]

A.D. 1860, February 3.—N° 279.

BARRÉ, LEON PIERRE.—Relates, 1st, to a mode of fixing the ends of fire tubes by removing the rings from the mouth of each tube, and applying round each on the tube plate a layer of cement composed of sulphate of lead, ryeflour, oil, and white of eggs; a brass plate of the same diameter as the tube plate, furnished with projecting ferrules brazed or cast thereon to correspond with and enter the end of each tube, is placed against the cement, which is also spread round each ferrule; a circular flanged washer is then driven into the end of each ferrule; a third plate perforated with holes to correspond and of the same diameter is fixed on the face of the

brass plate by bolts screwed into the tube plate to protect the brass plate from the action of the fire.

2nd. Relates to cleansing the outsides of fire tubes from incrustation, and the insides from soot and other deposits. A cylindrical mandrel "formed of several parts" is connected together by "a screw thread;" about one-half of the length of the mandrel is of the same diameter as the holes in the tube plates, and the other half the diameter of the insides of the tubes; when in use the thin end of the mandrel is forced through a tube up to the shoulder, which is formed by the two diameters; the thick end of the mandrel is then struck with a mallet, when the tube slides out of the tube plate, and whilst so doing the incrustation is scraped off.

[Printed, 8*d*. Drawing.]

A.D. 1860, February 3.—N° 289.

NEWTON, William Edward.—(*A communication from Charles Lowery and Horace Alonzo Miller.*)—This invention relates to a mode of expanding metallic packing rings of pistons, by the employment of two levers, formed to fit nearly parallel with each other across the inside of the piston, and against the central boss, which acts as a fulcrum to both. The thin end of each lever is bent, so as to catch the ends of a broad interna expanding ring, which at its circumferential parting is formed with suitable inclines to receive them; the packing rings are placed outside the expanding ring. A small cam is used to operate against the thick end of one lever, by pressing it towards the thick end of the other lever, which is supported by a fixed stop, and in proportion as these ends of the levers approach each other, their thin ends separate; by these means the parting in the expanding ring is opened, and the desired effect is produced on the metallic packing rings. A ratchet wheel and catch are used in connection with the cam, to maintain the opening pressure of the thin ends of the levers; the whole arrangement is contained within the piston.

[Printed, 6*d*. Drawing.]

A.D. 1860, February 4.—N° 294.

TAYLOR, James.—(*Provisional protection only.*)—Improvements in "traction engines" for use on rails, tramways, roads, or unprepared ground.

1. Suspending from a hinge by the side of each ordinary broad tyred wheel, so as to reach below their peripheries, a broad bar

curved downwards at the lower end, for the purpose of forming a movable flange or guide to each wheel, when in use on trams or rails; and supporting it in its place by a block and bracket fixed to the frame of the engine. Also to the use of circular flanges, against the sides of plain broad tyred wheels; these revolve on excentrics formed on adjustable bushes or collars, and fitted on the axletree. According to one position of the bush, the flanges and wheels can be made to work together, as flanged wheels on trams or rails, or by another position of the bush, the circular flange can be raised, so that its periphery is above the plane on which the broad wheel is alone required to run, as on common roads.

2. Regulating the speed and power of locomotive or "traction "engines," driven either by toothed gearing or with chains, by the use of male and female cones, instead of, as heretofore, by the use of clutches; or, "when motion is communicated from the "engine to the driving wheels, through overhanging half cranks "or stud discs and connecting rods, I fit upon the end of each "driving and each driven shaft a disc, having a slot therein across "its diameter, and each projecting stud or pin is caused to travel "along the slot by means of a screw, which is acted upon or "caused to rotate whilst the engine is in motion, by a tripping "piece or a curved rack being projected forward, so that the "pinion or star wheel upon the screw end is acted upon thereby, "and the projecting stud pins are caused to move along the face "of the disc."

3. Applying struts or legs, working upon studs fixed to the driving wheels near the axles, or on excentrics thereon, to be used in times of need for pushing a traction engine out of hollows, or up steep gradients, with arrangements for putting them out of action when not required.

4. Relates to completely encasing the gearing and parts of a locomotive boiler and engine, and providing openings and doors for gaining access to the working and other parts described in the specification of the "patent granted to me the 13th day of "November 1858, No. 2548."

5. Forcing the feed water through a group of pipes placed longitudinally in a chamber, through which the exhaust steam passes in a lateral direction on its passage from the cylinder to the atmosphere.

[Printed, 4d. No Drawings.]

A.D. 1860, February 4.—N° 297.

UREN, Edward Wills.—This invention, of a rotary steam engine, consists in driving a main axle by means of transverse slides acting in spaces formed within a series of cylinders, placed end to end concentric with the axis, upon which discs are fitted, which fill the central interior of each cylinder, leaving the annular space around. About one-fourth of this annular steam space is filled up with solid packing, the form of which inclines at each end, by tangent lines from the periphery of the disc to the internal diameter of the cylinder to which the packing is fixed. The transverse slides which pass through the axis are fitted at each end with "paddles" or plates, alternately sliding into slots in the discs, and dividing the annular steam space, thereby forming an abutment for the steam; the diametral length of the slides and plates through the axis extends from the interior of the cylinder at one side to the interior of the packing at the other. As the discs revolve, and the outer edge of the plates come in contact with the inclines, they are driven into the slots in the discs, whilst the plates at the opposite end are projected from the discs into the steam space against the cylinder. Steam is constantly supplied at one end of the steam space, and after operating the slides as they alternately come round is exhausted at the other end, passing into the second cylinder of the series, wherefrom, after driving round the slides, it passes into the third cylinder, and so on in progression to the last. "Occasionally," the remaining expansive force of the steam is employed in conjunction with the products of combustion, to operate a series of fans, which are connected to and add their assistance to increase the power of the engine; these fans work in a series of cylinders. The steam cylinders are placed either within or outside the boiler, and may be disposed round a central cylinder of the same size, giving off power by means of coupled excentrics, or otherwise; the engine is reversed by changing the steam supply to the opposite end of the series. Valves and stop cocks for changing the direction and cutting off the steam are provided.

[Printed, 1s. Drawing.]

A.D. 1860, February 4.—N° 306.

NEWTON, Alfred Vincent.—(*A communication from E. G. Allen.*)—This invention relates to combining within one case a

pressure gauge, one or more vacuum gauges, a counter for registering the number of revolutions of the paddle wheel or screw shaft, and a clock for indicating true time. Hitherto, these instruments have been placed at different parts of the engine room; this invention brings all together upon one face plat large enough to exhibit all the dials. The pressure gauge consists of a volute spring placed in two box couplings, which fix the outer coil of the spring, whilst the central portions of the spring are left free; an india-rubber diaphragm is held between the two couplings which covers the rear surface of the spring; the central coil is attached to a piston, which by means of a connecting rod and toothed sector arm, actuates a pinion upon the spindle, which moves the indicator arm round the dial on the main face plate. The vacuum gauges are constructed on the same principle, the volute spring and diaphragm being reversed in position. The clock is of the ordinary make, placed in position within the apparatus, so as to show time on a dial, which is engraved on the main face plate. The counter for recording the revolutions of the paddle wheels or screw is actuated by a series of discs, representing respectively units, tens, hundreds, thousands, &c.; each disc is divided into ten; one complete revolution of the unit disc moves the tenths disc one division, and one complete revolution of the tenths disc moves the hundredths disc one division and so on; each revolution of the engine shaft moving the units disc one division, and thus the count goes on; the result being seen through a series of openings in the centre of the main face plate.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, February 6.—N° 315.

McNAUGHT, WILLIAM. — (*Provisional protection only.*) — 1. relates to a mode of giving motion to cut-off, expansion, or slide valves, by means of a roller which is mounted on a stud fixed to that part of a connecting or other rod which describes a suitable path; the roller works in an internal cam, wherein are adjustable projections of such a form as will give the required motion to the rods of such valves as regards time and traverse.

2. the use of an india-rubber ring or segments placed round the periphery of the air pump bucket, "so that when the bucket "is lifting, the india-rubber is forced outward at its upper part "by the pressure of the water."

3. Neutralizing the pressure of steam on slide valves, by working such valves between their seating and a rigid adjustable back plate, which is firmly attached to the valve-box lid.

4. Lubricating cylinders or valves by means of a crosshead, centre pin, and a moving forked lever, which gives motion to a perforated plate, sliding or rotating between another plate and the bottom of the lubricant vessel, which is also a plate perforated with holes, through which the escape of the lubricant is regulated by the active or slow movement of the central plate.

[Printed, *4d.* No Drawings.]

A.D. 1860, February 8.—N° 332.

ROWAN, John Martin, and HORTON, Thomas Rogers. This invention relates to various improvements in steam engines and boilers, comprising also modifications of some of the improvements described in the Specification of the "Letters Patent" granted to these inventors April 19, 1858, N° 856. These engines are designed for working on the high and low pressure system. A low-pressure piston is fitted mid-length on a long trunk, which works through stuffing boxes at each end of a low-pressure cylinder; the flat ends of the trunk act as pistons to two single acting high-pressure cylinders, which are bolted concentrically to the ends of the low-pressure cylinder.

Six separate modifications of the above are shewn and described, relating to the positions in which the high and low pressure cylinders are respectively placed, and to the manner in which their piston rods combine to give off power.

Placing the slide valves of a compound engine worked by high and low pressure steam on one slide rod.

Combining valves and casing, and providing separate internal spaces to heat the steam passing from high to low pressure cylinders.

Applying "rotary and other" "mechanical agitators" to surface condensers; also to refrigerators for cooling water used for condensing steam.

Modifications of improvements in vertical and horizontal steam boilers, relating to several modes of tubular construction, and to

modes of directing their hot draughts through flues and along tubes in line or circuitous.

Also to the construction of boilers formed of rectangular thin chambers, with or without flue tubes, and combined with or without water tubes, around and between which the hot draught passes and circulates.

Apparatus for regulating the feed of steam boilers, and also a mode of adjusting the flue and ash-pit dampers.

Also to prevent air being pumped into a boiler by directing the feed water back to the cistern whenever the level of the water therein is becoming too low.

[Printed, 2s. Drawings.]

A.D. 1860, February 8.—N° 333.

WAIN, WILLIAM.—This invention relates to steam engines and superheating steam.

1. Compounding high and low pressure steam engine cylinders, whereby the steam having operated the high-pressure cylinder, exhausts into the low-pressure cylinders, where it works expansively, afterwards passing off to the condenser through a steam jacket which surrounds the low-pressure cylinder. An arrangement for a double pair of marine trunk engines is shewn; two low-pressure cylinders on one side the crank pairing with two high-pressure cylinders on the opposite side, so that the connecting rods of each pair shall work on the same crank throw; the centres of all the cylinders are placed on a plane with the centre of the crank shaft, each pair acting relatively thereon at an angle of 90°; the air pumps are placed by the side of the high-pressure cylinders sufficiently low for the pump rods, which are driven by the low-pressure pistons, to clear the crank shaft. The condenser extends the full width, and forms a box bed to each engine, upon which the crank bearings are mounted; the slide valves of each pair are arranged to be worked by excentrics with one rod answering for both valves; the usual reversing link motion is used. The invention is applicable to steam engines of other construction and arrangement.

2. Two cylindrical boilers, with tubular furnaces similar to Cornish boilers, are placed side by side, partly forming a flue between them, to which a bottom and arched roof are formed by metal plates attached to the boiler sides; a large steam chamber

tube reaching the whole length is placed along the centre of the flue; the steam on its passage from the boilers to the engines passes through the chamber, wherein it is intercepted and superheated by small transverse tubes placed at varying angles across the steam chamber, the whole surface of which is exposed to the hot draught from both boilers, receiving their products of combustion at one end and communicating with the chimney at the other.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1860, February 10.—N° 359.

AULD, David. — This invention relates to supplying steam boilers with water. A vertical chamber is placed above the water level of the boiler, into which feed water is admitted through two valves; one is opened and closed by the action of an ordinary float within the boiler, the other admits the flow of water into the chamber, but closes with back pressure. Within the chamber a float is suspended to a rod which passes through a stuffing box in the cover, above which it is connected to a chain, which after passing over a pulley is connected to a link to which a counterbalance weight is suspended; a stud on the link operates in a slot in a lever arm, which acts on the two prongs of a circular valve plate, which at the end of its action in each direction, by the aid of a faller, suddenly opens and closes the circular valve, which shuts off a steam communication between the boiler and the upper part of the chamber. A feed pipe, in which there is a back pressure valve, forms a communication between the bottom of the chamber and the lower part of the boiler. When the boiler wants water, the descending float opens the feed valve, the feed water then flows from the reservoir into the chamber through the back pressure valve, and by raising the float therein the slotted link, to which the counterweight is suspended, descends and depresses the lever until it comes in contact with one prong of the circular valve plate, which by throwing the faller over its centre, suddenly opens the valve; steam then rushes into the chamber, where the pressure in a short time is in equilibrio with the pressure in the boiler; the water in the chamber being above the boiler, has the advantage of its own gravity, and will then flow through the back pressure valve into the boiler; the descending float in the chamber suddenly shuts the steam off when the rising link brings the lever in contact with the other prong of the

plate valve, by the faller being thrown back over its centre to its normal position.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 10.—N° 360.

YARROW, Thomas Richardson, and NEILSON, Walter Montgomerie.—(*Provisional protection only*.)—Improvements in the arrangement and construction of parts of steam engines and boilers, being partly "in further development of the plans de-"scribed in the Specification of Letters Patent granted to Thomas "Yarrow, under date the 18th March, 1857 (N° 758), for 'im-"'provements in locomotive steam engines,' consist":—

1st, "in placing at the front of the fire-box and below the tubes "and transverse inclined arch or midfeather a series of air bars "placed nearly vertical for the admission of air directly to the fire. "This air screen or grating may be built up of separate bars, or "may consist of one or more pieces having numerous elongated "or otherwise shaped openings for the passage of air."

2nd, "consists in substituting for the ordinary fire-door a plate "loosely hinged to the top of the aperture so as to open inwards, "and which when closed hangs in a more or less inclined position. "This door pulsates or moves intermittently from the action of "the draught, and admits air to the furnace."

3rd. An improved piston "formed with an external packing "ring cut into four or other convenient number of segments. "This external ring is backed or lined with an inner ring also "cut into as many segments as the outer one, the two being "arranged to break joint." A slightly compressed spring corrugated across its breadth is placed within the rings.

The improvements in boilers relate to superheating steam for locomotive or other engines. A steam chamber is formed along the top of the boiler, communicating therewith by a series of tubular passages which pass through a fire-flue from which the hot draught can be diverted at the time the steam is shut off from the engine; the cylinders are fed from the steam chamber.

Heating feed water by exhaust steam. This apparatus consists of, "by preference, two vertical pipes or elongated chambers of "any convenient form and of considerable length (say five or six "feet). These chambers communicate with the feed pumps at "their lower ends, whilst a portion of the exhaust steam of the

" engine is admitted at their upper ends, and condensing, heats
" the feed water contained in them."

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 11.—No. 370.

ALDRED, WILLIAM, and MAYNES, JOHN.—(*Provisional protection only.*)—Apparatus applicable to steam boilers. Consists of a weight or float confined in a steam-tight case, which is placed above a steam tight chamber in which, at a suitable working level, a fluid such as mercury or water is contained and into which, below the working level, the end of an open pipe descends from the bottom of the case, with the interior of which it forms a communication. Another pipe opens a passage for steam from the boiler into the upper part of the chamber. The fluid is driven by the pressure of the steam on its surface up the pipe into the case, where it floats and maintains the weight at a working level, but when the steam rises to an undue pressure the fluid continues to rise into the case until its level in the chamber sinks below the end of the pipe, when " the communication between the case or receptacle and the fluid is broken, and the fluid in the case is evacuated through the pipe, leaving the weight or float to descend for want of support. From this alteration in the position of the float or weight dependent upon the change in the level of the fluid, we derive, by combinations with other apparatus," the means of opening service and safety valves, alarm whistles, and signals, and also of keeping the steam valve of a pumping donkey engine open until the water in a boiler re-attains its proper level.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 11.—N° 378.

HUMPHRYS, EDWARD.—This invention relates to a particular arrangement of vertical tubes within the uptake of marine steam boilers for the purpose of superheating steam. A marine tubular boiler with four furnaces separated by water spaces is shewn and described. The mouths of the furnaces are ranged in a line across the lower part of the front of the boiler; they all open into a combustion chamber at the back, the burning gases returning through groups of fire tubes to a chamber in the front which extends the whole width of the boiler, gradually projecting forward over the

furnace doors; above this chamber there is another separate chamber communicating with the chimney; the horizontal space between the two chambers is filled with a large number of short vertical fire-tubes which open into both chambers and form the uptake for the products of combustion. The steam in its passage out of the boiler is brought down from the highest level in the steam chamber and enters at one end amongst the superheating tubes, coursing through them to the other end where the steam outlet to the engine is situated. A modification suitable for ships of war is shewn and described, in which the superheating tubes are placed on a level with the furnaces, the steam afterwards passing through a steam pipe within the steam space of the boiler.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1860, February 14.—N° 399.

LEATHAM, WILLIAM.—Governing steam engines. This invention relates to a mode of friction driving an ordinary ball governor at a variable speed by means of a surface friction disc on a counter shaft, acting upon the periphery of a friction pulley; this pulley is fixed upon the lower end of a tubular slide upon the governor spindle to the upper end of which the ball levers connecting links are jointed and the forked lever guide is fixed. When the speed of an engine so governed increases, the action of the governor not only increases relatively, but also at an increasing ratio, according as the point of contact between the friction pulley on the radius of the friction disc rises from its centre, and vice versa when the speed of the governor diminishes and the point of contact falls towards the centre of the disc. Also, to an equilibrium throttle valve, consisting of two circular valves on a spindle, upon which the double or triple thread of a coarse pitched screw is cut, to work through a bush in the valve box; the valve seatings are turned on a gun or other metal bush, one on the upper end and the other on an internal ring at the lower extremity; the steam is admitted between the two valves, its pressure by reason of their corresponding areas being equal on both; they are operated by means of the screw when a lever arm on the end of the spindle is actuated by a connecting rod or lever in connection with the governor.

[Printed, 8*d*. Drawing.]

A.D. 1860, February 15.—N° 411.

MORRISON, Robert.—(*Provisional protection only.*)—Improvements in marine engines and boilers. Relate, 1st, to constructing the shell of a cylindrical boiler with a conical fire-box fitted with conical cross tubes to increase heating surface, keep up a constant circulation of water, and mix the gases, whereby the process of combustion is stimulated. The upper space in the furnace constitutes a combustion chamber; air is admitted to the fire above the furnace door. A flue from the top of the furnace through the side of the boiler, and level with the top of the furnace, conducts the flame and hot draughts into external flues. Several of these boilers are placed close together in a circular group with a chimney in the centre, wherein the feed water is heated and the steam superheated in tubes by the hot draughts from the boiler flues, assisted by a separate furnace at the foot of the chimney.

2nd. Constructing a gauge to indicate the water level in boilers, such gauge being fixed at any convenient height without relation to the proper working level; a ball, which floats upon the surface of the water, is attached to a rod which passes out through the boiler shell up into the gauge glass, to reach which the rod must be suitably bent.

3rd. Constructing a surface condenser internally divided by metal plates into alternate separate thin spaces or channels for the exhaust steam, with intermediate thin spaces for the cold water; the plates are placed about a quarter of an inch apart within a chamber, into which the exhaust steam and water are admitted through separate channels which open into the alternate spaces. Placing condensers between the back frames of engines of the inverted cylinder class.

4th. The use of three cylinders for engines above 150 horse power working on a three throw crank axle, the three throw pins being placed in such a manner as will divide the circle described by them into three equal divisions of 120°. Also, using two cylinders in small engines and balancing the crank. Enclosing the working cylinder in a steam jacket supplied by a donkey boiler with steam of higher temperature than that which is used in the cylinder.

The use of two steam, two exhaust, and two expansion valves to each cylinder, and sometimes for working these valves four

excentrics are fixed upon the shaft, and two loose ones for the expansion valves, which are worked by proper stops; a link between the excentric and the valve rods is so arranged that it will cut off the steam at any point of the stroke.

Also, employing only two excentrics for the steam valves and two for the expansion valves, all loose upon the shaft, and worked by proper fixed catches; the rods are connected direct to the slide rods and the engines are reversed by two auxiliary valves.

"When it is found desirable to expand the steam to fifteen or "sixteen times I use three cylinders, and make the middle cylin-"der a high-pressure one and the other two low-pressure "cylinders; by this arrangement I obtain a great amount of "expansion. I prefer, however, in all cases, for the sake of "simplicity, to expand entirely in one cylinder."

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 15.—N° 418.

HAMILTON, John, and SILVER, Thomas.—This invention, relating to marine steam engines, consists in causing temporary back pressure in the cylinders, at those times when by the lifting of the screw or paddle wheel as a vessel pitches or rolls, the engines are disposed to "race." The effect is obtained by interposing a throttle valve in the exhaust passage between the cylinder and the condenser, which valve may be operated by hand, or be made self-acting by suitable connections with a governor; the condenser injection cock may also be placed in connection with a governor, so as to regulate the supply according to the quantity of water required; both of these arrangements may act in concert with, or independently of the ordinary throttle valve. The construction of the passages on each side of the valve, as also in the back pressure valve in connection with the exhaust, should be enlarged and the valve correspondingly increased, in order that limited action may give sufficient passage for the steam; it is also preferred to balance the injection cock. The governor represented is of the kind known as "Silver's momentum governor;" other governors may be used for the purposes of the invention.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 17.—N° 435.

BELPAIRE, Alfred.—This invention relates to the fire-boxes, doors, and other parts of locomotive and movable steam engines,

the object being to obtain the use and better combustion of small coal or slack, anthracite, or turf. The fire-bar surface is increased and the fire-box proportionately enlarged, by extending it lengthwise, and a proper disposition of the other parts made, so as to provide against any impediment to locomotion; the alterations effect a better distribution of the weight in four or six wheeled coupled engines, and equalize it on the coupled axles. The fire-doors are made in two parts and lined with fire-brick, through which there are holes for the admission of air regulated by a sliding plate; the doorway is nearly level with the surface of the bars, and sufficiently large for giving free access to, and command over the fire. The fire is thinly spread over the bars to the depth of about four inches, and the stoker's platform is sunk below the usual level. The grate surface is rather narrow; the bars may be laid singly, or so fastened together in groups of 10 or 12 bars each as to leave air spaces between each bar. A portion of the bars are made to move up and down, in order to loosen clinkers and remove impediments to the draught. The fire-box is shallow, and admits of the axle of the largest wheels being placed underneath, thereby effecting a better distribution of the weight. The axle is protected or sheltered from the heat by a saddle.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 18.—N° 446.

GILLIS, Pierre Adolphe. — Regulator for engines. An ordinary ball governor is driven from the engine; the sliding sleeve or "slider" on the governor spindle is lengthened; at the top the two connecting rods are jointed as usual; lower down a small bevel wheel is fixed upon the slider, and the lower end is encircled by two collars which form a circular groove to receive and guide the end of a horizontal shaft projecting from a bearing which has liberty to move up and down; the bearing at the other end of the shaft acts on a centre; a worm is fixed on the shaft between the two bevel wheels, which can revolve clear of the worm, on spindles fixed to the frame; a bevel wheel is fixed on the boss of each worm wheel, and fixed upon an upright shaft are two bevel toothed segments which gear into them; upon the same shaft the lever arm which works the throttle valve is also fixed. While the engine maintains its proper speed, the worm continues to revolve inactively in the space between the two worm wheels, but whenever the speed diminishes, the slider on the governor spindle

depresses the worm shaft, and the worm is brought into gear with the lower worm wheel, by means of which the corresponding bevel wheel and segment are set in motion in the direction to slowly open the throttle valve; and whenever the speed is too high, the worm shaft rises and sets the upper worm wheel in motion and its corresponding bevel and segment, which, by actuating the valve lever on the upright shaft in the contrary direction, slowly cuts off the steam.

[Printed, 8*d*. Drawings.]

A.D. 1860, February 20.—N° 456.

MOFFAT, JOHN.—(*Provisional protection only.*)—"Improve-"ments in steam boiler furnaces" for preventing smoke.

"The invention consists in inserting along the middle (or "longitudinal centre line from front to back) of each furnace a "series of air ducts which pass through the fire and grate and "receiving the air from the ash-pit discharge it above the surface "of the burning fuel. It is preferred to shape these air ducts "so as to discharge the air laterally and downwards upon the "burning fuel, and they may be conveniently formed by means "of fire-brick blocks or cast-iron framing shaped in a suitable "manner. If found necessary or desirable the supply of air may "be regulated by means of dampers on the ash-pit mouth, or "applied to the ducts themselves."

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 22.—N° 480.

BATESON, SAMUEL STEPHEN.—Generating steam and heating apparatus, relating to an improvement on previous inventions for which Letters Patent were granted to this inventor, dated respectively December 30, 1858, N° 2995, and March 31, 1859, N° 809, for heating liquids and generating steam by subjecting tubes or coils of pipes, through which a circulation of water is kept up, to the action of fire. The improvement consists in the use of two pipes, one within the other; the smaller pipe, which is placed in the centre of a heating tube or feed coil, is, where the outer pipe is subjected to the greatest heat, perforated with slots or holes, through which a supply of water is conveyed to those parts of the outer pipe where it is most needed, and a current is thereby constantly kept up through such tubes or coils; both ends of the

inner pipe enter the boiler below the water level. The feed enters the outside tube, which after passing along the top of one of the flues of a two-flue boiler, and coiling round the combustion chamber, returns through the other flue, and is discharged into the boiler through a stop-cock. A two-way single-plug cock is used, so that the feed water may be circulated through the coil or sent direct into the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 23.—N° 495. (* *)

REDFERN, JOHN. — " Improvements in the construction of " steam boilers for increasing the durability thereof, and also for " economizing fuel."

" I propose to make the fire-box in two or more separate parts, " and to have as many fire-boxes in one boiler as may be re- " quired, extending the whole depth or length of the boiler. " Over the crown of each fire-box is a thin water space, the " upper side of which is a flue or flues, along which the heat from " the fire passes, entering said flue or flues at the back end of " the fire-box or back end of the boiler, the heat again passing " by a cross flue at the front of the boiler, and entering the tubes " thereof, passes along them."

The patentee claims the mode of " constructing multitubular " steam boilers, by which the heat from the fuel in the fire-places " or furnaces thereof, being caused to pass through or along a " flue or flues " " is more effectively employed," the " burning " of the tubes and tube plate prevented or materially lessened, " the durability of the boiler increased, and economy in fuel " effected."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1860, February 24.—N° 498.

DEAN, THOMAS, KNOWLES, JAMES, and KNOWLES, THOMAS. — (*Provisional protection only.*) — " Improvements in " machinery or apparatus for obtaining motive power." " Instead " of the ordinary cylinder and piston for giving motion to the " first moving power by means of steam or other agent, we use or " employ a double tube or slide tube with a cross resisting plate " *in or* about the centre thereof, on which the steam or other " *motive agent acts* above and below it, thereby giving the

"necessary up-and-down motions in vertical engines, but the "same principle will apply to horizontal or diagonal engines."

[Printed, 4d. No Drawings.]

A.D. 1860, February 24.—N° 500.

ROBERTS, SAMUEL.—This invention relates to a mode of constructing steam engines so that they may generate their own steam, whereby the ordinary boilers, as at present in use, are entirely dispensed with. Placed "on each side of the furnace" is "a steam cylinder, or one cylinder only may be used. Above "the furnace (springing from each side in an oblique line towards the upper part) are two flat metallic steam pipes or "spaces running back to the depth of the fire-place, into which "the water is passed from the pump, and allowed to enter each "space alternately by means of a slide valve box charged with "water, which is to be so regulated as to allow only the required "quantity of water to pass." The great heat to which the flat metallic pipes are exposed instantly converts the water so admitted into steam, which then operates the pistons in the cylinders in the usual way, the valves for admission and emission being timed accordingly. Sometimes an annular piston is used when a horizontal metallic generating tube is placed in the centre of the cylinder at the end of the furnace flue, which is turned up for that purpose.

[Printed, 4d. No Drawings.]

A.D. 1860, February 24.—N° 509.

BARCLAY, ANDREW.—(*Provisional protection only.*)

This invention relates to steam engines constructed and arranged for the purpose of raising water from mines and other similar places. According to one modification the engine cylinder is fixed upon a suitable foundation beside the mouth of the mine shaft, or, if preferred, it may slightly overhang. The piston is connected to one arm of an overhead beam, between the centre and the extreme end which overhangs the mine shaft, and to which the pump rods are attached. The opposite end of the beam is jointed to a vertical rocking shaft, which serves to counterbalance the overhanging end. The air pump is placed between the cylinder and the rocking shaft directly under the beam, to which the air pump rod is connected. The pump rods of engines

so constructed and arranged are easily disconnected, without interfering with any part of the engine, which is entirely out of the way of the pumping gear. The arrangements may be modified by disposing the cylinder above the beam and arranging the beam in a recess sunk in the foundation; or the cylinder may be placed on one side of the mine shaft, and the beam be arranged to extend across it, the extreme end of the beam being connected to the piston rod, and the pump rods intermediately attached to that part of the beam which is over the mouth of the shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 25.—Nº 521.

LAMBERT, THOMAS, and WAKEFIELD, OBED.—This invention relates to improvements in fitting up cocks and valves, by means of which a pointer indicates, on a graduated scale, the distance of the valve from its seat, and when it is fully opened or closed. Two screws of different pitches are cut upon the valve spindle, the finest works through a bush in the neck of the valve casing, and is for the purpose of opening and closing the valve. The second is a coarse pitched screw cut near the outer end of the spindle, which is lengthened, and if necessary enclosed in a case. A projecting pointer, fixed in a thin nut on the coarse screw, works through a slot in the case, and indicates, as the spindle wholly or partially revolves, on an extended scale the precise position of the valve. The object of the invention being to move the pointer by the same movement of the spindle through a much greater space than the fine screw moves the valve.

[Printed, 6*d*. Drawing.]

A.D. 1860, February 25.—Nº 527.

SILVER, THOMAS, and HAMILTON, JOHN.—Regulating the speed of steam and other engines, &c. " Consists in mounting " balls or other weights upon lever arms so that they shall revolve " around a central axis, ths levers being at right angles to the " central spindle, and be free to vibrate tangentially; such vibra- " tion or motion shall be parallel to the plane of rotation or " motion, instead of as in " Watts' governor, where the angle of the pendulous arms, and the position of the planes of rotation of the balls, are constantly changing by variations in speed. The balls are mounted on lever arms, to which toothed segments are

attached, the centres of which work loosely on rods, which act also as stays between the ends of two supporting arms, which are fixed a suitable distance apart upon the central axis or spindle; a loose lever arm is fitted on the spindle between the two fixed arms, which when the apparatus is at rest is nearly at right angles therewith; two links form a connection between the ends of the loose arm and the weight arms, which are thus brought parallel with each other on a plane, at right angles with the central spindle, through which, between the two fixed supporting arms, a strong pin is fixed projecting at right angles from each side, upon which two bevel toothed segments partially revolve and gear into the bevel segments on the weight levers; two links form a connection between the grooved sliding sleeve on the central spindle, which operates the valve lever, and the two segments on the projecting studs. There is a spiral spring upon the spindle between the sliding sleeve and one of the fixed arms, the power of which is partially overcome when the apparatus is in action, and the balls centrifugally expand, but which when the apparatus is at rest presses against and moves the sliding sleeve, and by means of the connecting links and segments the balls are then brought into their normal position towards each other.

Modifications in the mechanical arrangements are referred to, also the use of a fly wheel in connection with weight balls, of which the inventor does not confine himself to the use only of two. Reference, without dates, is made to other patented inventions of the said Thomas Silver and others.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 28.—N° 546.

WEIR, George.—This invention relates to the mode and apparatus for regulating steam and other motive engines. The apparatus for regulating the action of condensing engines may be applied alone, or in combination with a speed governor which acts on the supply of steam. It consists in automatically regulating the supply of injected condensing water, proportionate to the quantity required to reduce the steam passing through the engine. The apparatus is attached to the outside of the condenser; it is divided into three compartments, the lower division is a valve chamber open to the condenser, and communicates through the valve with the central division through which the injection water

passes; this division is separated from the upper by a flexible diaphragm centrally attached to the valve spindle, which passes up through the top division and out through a stuffing box, above which it projects, and is loaded with a suitable amount of weight; the division above the diaphragm communicates with the condenser by means of a pipe. The area of the diaphragm is larger than the valve, which the pressure on the water in the central chamber has a constant tendency to close; this is counteracted and adjusted by the weights on the valve spindle, whilst the effective pressure on the diaphragm, which corresponds with the pressure in the condenser, will so act thereon as to effect more or less the closing or opening of the valve, and so regulate the supply.

The speed governor acts centrifugally. A couple of weights are fixed upon the ends of arms jointed to the outer ends of a diametrical frame which is loose upon the governor shaft; a boss with two short arms diametrically opposite, and connected by links to the outer ends of the weight arms, is fixed upon the shaft within the frame; the weights balance each other, and when in action and obeying the law of centrifugal force, act against opposing springs or weights, and by means of a slider operate the throttle valve.

Modifications of both regulator and governor are described and illustrated.

[Printed, 8d. Drawing.]

A.D. 1860, February 28.—Nº 551.

ANDERSON, ALBAN.—This improvement in governors of motive-power engines relates to the practical application of the action of a disc, revolving on its axis while rotating vertically in a frame, which is mounted on the end of a vertical shaft, and revolves within the hollow of a stationary dished bevel wheel, down through the centre of which the shaft passes and is driven by the engine through bevel wheels underneath; a long boss on one arm of the frame carries a short horizontal shaft and pinion, which gears into the stationary bevel wheel: the other end of the frame is divided and turned over in a line with the centre, to receive two studs which are attached to a yoke, and are the fixed points on which it acts; a stud, upon which the disc revolves on *its axis*, projects from between the arms of the yoke in a line with *the horizontal shaft*, which drives it by means of a universal

joint; two bent side rods form an attachment between the yoke and a central pivot joint above, which is fixed to the centre of a spring bar, mounted at each end on upright supports attached to the outside of the stationary bevel wheel. The pressure of the spring bar on the yoke inclines the disc to an angle of about 45°, but when the vertical shaft rotates the frame, the horizontal shaft is made to revolve by means of the bevel pinion, which runs round the fixed gearing of the stationary bevel, and the disc then revolves quickly on its own axis as well as rotates with the frame. When an engine so governed attains its proper working speed, the revolving disc will have overcome the pressure of the spring and assumed an upright position, but whenever the speed is too high, the disc inclines over to an angle on the opposite side, and this action of the disc is made to act on slide and other valves which regulate the speed of engines and machines in motion; the centre of the spring bar above the pivot joint being the actuating point to which their connecting rods and levers are attached.

[Printed, 6*d*. Drawing.]

A.D. 1860, March 1.—N° 576.

NASH, William Henry.—" Improvements in steam engines," relating to an apparatus through which the exhaust steam from a high-pressure cylinder shall be returned into the boiler without condensation.

" The exhaust steam of a steam engine is conducted by a suit-
" able pipe into a small chamber, from which there is an opening
" into the atmosphere, the end of the pipe entering into the
" chamber. At the side of the chamber opposite the end of the
" above-mentioned pipe there is another pipe leading to the
" boiler, the nozzle or opening into which is of less diameter than
" the nozzle or end of the pipe coming from the engine. In the
" pipe leading to the boiler there is a valve, which is arranged to
" open inwards towards the boiler. The nozzles or ends of the
" two pipes come near to each other, leaving, however, an open
" space between them." The inventor says—" By this arrange-
" ment the rush of the exhaust steam will overcome the valve,
" and part of the steam will enter the boiler and part escape into
" the atmosphere," or it may be collected into any other receptacle and *applied to any other purpose.*

[Printed, 6d. Drawing.]

A.D. 1860, March 3.—N° 589.

RAMSDEN, William Grandage.—Boilers for generating and superheating steam. A series of vertical chambers, simicircular, or of other suitable pressure bearing form, each having one flat side, are ranged in line on brickwork a suitable distance apart; the upper ends of each range of chambers open into two longitudinal cylindrical chambers, about the centre of which is the water level; these chambers by short branch pipes communicate with a central superheating cylindrical chamber above, which is supported thereby. Groups of small heating tubes, under which the furnace is placed, are fitted crossways into the flat sides of the pairs of vertical chambers, and connect and form open water communications between them. A steam box is fitted on the top of the steam chamber, out of which an internal pipe, which descends through the bottom of the steam chamber and passes along over the groups of tubes, conveys the steam to the engine. The whole apparatus is confined in a casing which opens into the chimney. A modification of the above is described for generating low-pressure steam.

[Printed, 10*d*. Drawing.]

A.D. 1860, March 3.—N° 595.

HUMPHRYS, Edward.—This invention relates to the construction of steam boilers, and the combined application of a feeding and a blowing apparatus to marine boilers, for the purpose of producing a corresponding effective result from only one-fourth the ordinary area of the fire-bar surface. The boilers are constructed in two separate parts bolted together; one part comprises the furnace which is surrounded by water space, excepting a passage through which the flaming products of combustion pass into the tubes of the main boiler. A fuel hopper fitted with a cellular feeding cylinder is placed on the top of the shell of the furnace, into which the fuel falls, through a vertical passage, upon the fire. A fan is placed either in the uptake of the chimney for driving air into the furnace through the furnace bars, or contiguous to the front of the ash-pit, which is then closed and the air forced therein by the fan. Both the feeding cylinder and the fan are driven at a regulated speed by the machinery. The fire-bars simply pieces of bar iron, the ends of which project from the face

of the furnace door-frame, are so arranged that they may be withdrawn singly for the purposes of cleaning, cooling, and straightening.

[Printed, 10*d*. Drawing.]

A.D. 1860, March 7.—N° 621.

HUGHES, Edward Thomas.—(*A communication from William Henry Christian Voss.*)—(*Provisional protection only.*)—Obtaining rotary motion by the alternate pressure of steam on the surface of heated water contained in two vertical reservoirs mounted upon a horizontal reservoir, which is divided by a transverse partition, through which, supported in bearings and stuffing boxes fitted to the ends of the horizontal reservoir, passes hollow shafting, on which re-acting wheels are mounted, through oblique passages in which, in connection with the interiors of the shafts, a communication is formed between the vertical reservoirs. While steam is being admitted upon the water surface in one reservoir, cold water is made to condense the steam above the water surface in the other, the motion being kept up by opening valves and passages for steam and water, by the action of a disc, "with curved rectan-" gular openings," placed inside near the top of each of the reservoirs, and as the water rises and falls a reciprocating motion, equal to 90° of a circle, is thereby obtained. The heated water in turns is driven up and down with great violence in each vertical reservoir, by the alternate pressure and condensation of steam on its surface, which gives rotary motion to the re-acting turbine wheels on the hollow shafting by its rapid passage therethrough.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 7.—N° 626.

BEARDMORE, William, and RIGBY, William.—(*Provisional protection only.*)—"Improvements in steam engines."
" Relate to a peculiar construction of steam engine described in
" the Specification of a patent granted to us, dated 11th October
" 1853, (N° 2326), and consist partly in applying to or combin-
" ing with such an arrangement of steam engine, a high-pressure
" cylinder within the low-pressure cylinder, in such manner that
" high-pressure steam is received into the central cylinder, and
" having actuated the piston therein, it passes into the external
" cylinder, and actuates a ring piston therein, and from thence

"the steam passes into the condenser, which may be worked by "injection or surface cooling. The piston rod of the high-pres- "sure cylinder is connected to a cross head, to which two of the "ends of the two piston rods of the ring piston of the low- "pressure cylinder are affixed. The other ends of the two piston "rods of the low-pressure cylinder give motion to the hollow "trunk of the air pump, as described in the Specification of our "said former patent, and the trunk gives motion by a connecting "rod as therein described to the crank shaft."

The cross-head is dispensed with when the annular piston is worked by the high-pressure steam, which, after expansion, then passes into the central cylinder and thence to the condenser.

[Printed, *4d.* No Drawings.]

A.D. 1860, March 8.—N° 627. (* *)

DELABARRE, Christophe François.—(*Provisional protection only.*)—"Improved apparatus to be used in propelling gases "& forcing liquids."

This invention is an improvement on one for which a Patent, numbered 346, was granted on the 15th of February 1855. In this improved apparatus jets or streams of steam are caused to enter a tubular space, into which water or elastic gas "enters "either by partial vacuum created by the jet or jets, stream or "streams of steam or . . . by head pressure, and in either of "these cases is propelled with great dynamic momentum against "any statical pressure of any power that it may be desired to "overcome, and against which the water, liquid, air, or any elastic "gas has to be forced." The arrangements of the means and combinations of the parts employed for these purposes constitute one part of the present improvements.

The second part consists of modifications in the shape and dimensions of the blowing apparatus described in the before-mentioned Patent. Two blowing apparatus are applied at each side whenever the grate or furnace is of considerable length. They may be made to act on the top surface of the fire, and may be made to act at any desired angle. "The change in the relative "dimensions consists in so contriving the apparatus that a greater "or lesser quantity of air may be admitted as compared with the "quantity of steam . . . according to the nature of the fuel used "or construction of the furnace."

[Printed, *4d.* No Drawings.]

A.D. 1860, March 8.—N° 633.

BELL, John, and CUTTS, William.—(*Provisional protection only.*)—" Improvements in steam engines," "relating to that class " of steam engines known as horizontal condensing, and consists " of constructing and arranging them so that the air pump with " its necessary apparatus shall be above ground instead of being " placed in or about the foundation of the engine, or below the " floor level as heretofore adopted, the force pump working " with a short stroke, and the air pump with a separate cylinder, " crank, or other suitable means. We also make the foundation " plate hollow so as to act as the condenser, or we can make the " condenser independent of the bed if desirable."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 8.—N° 637.

NAPIER, John.—(*Provisional protection only.*)—" Improvements " in steam engines," relate to a mode of so combining high and and low-pressure cylinders, that the rods of their pistons shall either act upon one crosshead, or otherwise if necessary. The high-pressure cylinder in which the steam is first worked expansively, is placed concentrically inside the low-pressure cylinder, which forms an annular space around it; the steam which gives the down-stroke to the high-pressure piston, afterwards gives the up-stroke to the low-pressure piston, and *vice versâ*. Motion may be transmitted from the crosshead direct to the crank shaft, or by the usual arrangements of double piston engines. The compound annular cylinder is also made to oscillate on trunnions for giving motion direct to crank shafts of marine and other engines.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 9.—N° 642. (* *)

SAWYER, Joseph.—(*Provisional protection only.*)—" Improve- " ments in the construction of furnaces for steam boilers and " other purposes." The fire-bars are made with vertical grooves in the sides, the grooves on one side of the bar being opposite the spaces in the other side of the bar, so that in one position of the bars they are suitable for burning coke and by reversing the same they are then suitable for *burning coal*. The bridge is made close

to the boiler, and is made curved forwards so as to direct the smoke towards the centre, where there is "an opening sloping "upwards." The fire-door, which is suitable for small furnaces, is made with a hopper attached to it with a movable bottom and a slide or shoot.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 12.—N° 659.

HOWELL, Joseph Bennett.—(*Provisional protection only.*)—Tubes for boilers. Relates to the use of curvilinear, spiral, or hellically bent tubes for multitubular boilers, in order to diffuse the draught through such tubes and thereby obtain increased heating surface.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 12.—N° 660.

DAVIES, George.—(*A communication from Pierre Verrier.*)—(*Provisional protection only.*)—Improvements in steam engines and boilers. Relate to a mode of so dividing a boiler into two distinct compartments, that one division shall produce steam at a high pressure, whilst the other division receives and superheats the same steam after it has passed through and been expanded in a high-pressure cylinder; and also to the so arranging a high-pressure cylinder and a low-pressure cylinder to act in concert at right angles on one crank, that they shall be quite independent of each other as regards the steam, which is supplied to each respectively from the separate divisions of the boiler, and which after passing through the low-pressure cylinder is condensed in the usual manner. The objects sought are, to avoid concussion and irregular movement; to reduce weight; "to avoid in a great "measure the loss of heat which takes place when a high-pressure "cylinder is put in communication with a condenser;" and to "utilize low temperatures."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 12.—N° 662.

NEWTON, Alfred Vincent.—(*A communication from Henry Waterman.*)—"Improvements in steam engines." An apparatus *for maintaining heat*, superheating steam, and separating watery *particles therefrom*, by a mode of enclosing the steam cylinder,

side pipes, and steam chest in a steam-tight chamber, in and through the top of which the glands of the piston rod, the slide and throttle valve rods are fitted; the steam supply from the boiler enters the chamber through an open pipe connected therewith; within the chamber the throttle valve is attached to one end of a pipe which after coiling many times round the cylinder terminates by affixture to the steam chest; the steam which is supplied to the cylinder from the chamber through the throttle valve, "where it is "wire drawn as it is termed," is afterwards superheated and expanded on its passage through the coil to the steam chest by the normal temperature of the surrounding steam. Condensed water may be removed from the lower part of the chamber by a force pump or otherwise; the exhaust steam passes off through a pipe to the condenser or to the atmosphere. When an auxiliary boiler is used to supply the chamber the engine cylinder is then supplied with steam direct from the boiler through the throttle valve and coil, both of which (if preferred) may be placed within the steam room of the boiler instead of within the chamber, which then receives steam through the coil and feeds the engine direct. Arrangements are made for obtaining access to the cylinder and steam chest by the easy removal of the chamber top, and for admission therein when necessary.

[Printed, 10*d*. Drawing.]

A.D. 1860, March 13.—N° 669.

MILLER, MARMADUKE, and KEMP, JOHN.—Water and steam gauges. A small steam-tight cylinder or vessel, communicating by top and bottom pipes, is placed vertically beside the steam boiler, its mid-length being about level with the proper working water level in the boiler; through the upper end of the vessel a cast-metal cylindrical casing is fixed transversely, from which a number of tubes of unequal lengths with open ends, which are fitted equidistant into a longitudinal series of holes in the casing, descend into the vessel, graduating from the longest on one side to the shortest on the other; a hollow tapering plug is fitted into the casing, along which radial holes are drilled to correspond with the holes in the casing, but so that the communication through the several tubes between the chamber and the centre of the plug shall open singly and *at intervals* as the plug is turned; an index *graduated to correspond with the* level at the end of each tube is

fixed to the face of the casing, and a pointer to the projecting end of the plug, to indicate, by the emission of either water or steam, the height of the water in the boiler as the tubes in succession are opened and closed; to indicate the pressure of steam, two flanges, between which there is a flexible partition or diaphragm, are fixed on the end of a bent tube which communicates with the boiler; the neck of a flat circular case is fixed to the outer flange, a flat tapering spring extends nearly round the interior of the case to which the thick end of the spring is attached; the thin end of the spring terminates opposite the neck of the case, through which there is a plunger abutting with one end against the centre of the diaphragm and the other end against the end of the spring, through which a pivot on the end of the plunger, by means of a link jointed thereto, gives motion to a toothed sector, which is mounted on a fixed centre inside the case; the sector actuates a small tooth wheel, which on a central spindle through a bush in the case moves an indicator round an external graduated scale; the indicator tends to its normal position by means of a spiral spring inside the case.

[Printed, 8*d*. Drawing.]

A.D. 1860, March 14.—N° 680.

HORTON, Isaac, and KENDRICK, Isaiah.—Steam boilers, combined to generate, expand, and superheat steam. A series of four vertical boilers are ranged in front line with narrow flue spaces between; these boilers are fitted with internal furnaces in the usual way. Three other vertical tubular boilers without furnaces are ranged in line at the back, so as to leave a uniform flue space between them and the front four; within the two outer boilers of the back range, forming narrow water spaces around, there are long vertical chambers; each of these boilers receives the hot draught through suitable passages from two of the furnace boilers in front, into the top of their central chambers, which are fitted with water tubes sufficiently apart to allow a downward passage for the heat, which passes out low down in the central chamber of each boiler into a heat box within and near the bottom of the central boiler, which receives the residue of all the products of combustion from the four furnaces in the front range, out of which the hot draught then passes up through a group of vertical tubes into an upper chamber in the central boiler which is partly

above the water level; out of this chamber it ascends through a superheater formed by a group of tubes in the steam space, and thence to the chimney; from the superheater the steam passes into a receiver to which the engine supply pipe is connected. Other modifications are shewn. Also, "constructing and arranging "steam boilers for marine purposes in such a manner as to leave "or form a central or back high-pressure smoke box, whether a "generator be placed in such smoke box or not."

[Printed, 2s. 6d. Drawings.]

A.D. 1860, March 14.—N° 682.

HOPKINSON, JOHN ADDY, and RIDINGS, ALFRED.—(*Provisional protection only.*) — Relates to improvements in steam boilers. 1. The transverse introduction of an expansion flange or flanges in the construction of the furnace tube flues of boilers, for the purpose of compensating for the unequal expansion which takes place relatively between the tube flues and the shell, whereby any undue strain on the boiler ends is prevented.

2. Staying the flue tubes of boilers when the pressure is external, by encircling them with rings to which the flue plates are either rivetted or drawn outward by bolts and nuts to prevent collapse.

3. Fixing plates to the side shells of boilers to act as abutments for cross bars, through the aid of which, secured by bolts and nuts, the boiler ends are strengthened.

[Printed, 4d. No Drawings.]

A.D. 1860, March 15.—N° 686.

SHEARMAN, CHARLES HENRY.—(*Provisional protection only.*) —"Relates to certain improvements in the means of communi-"cating motion to a locomotive engine, or other machine, by the "use or employment of one cylinder, instead of two or more "steam cylinders, and consists in converting the alternate or re-"ciprocating movement of the piston into a circular motion by "the intervention of racks gearing into pinions, and in certain "cases, by the employment of cylinders or drums, and straps, "bands, or chains alternately wound and unwound therefrom, "and by means of right and left hand rachet boxes fitted upon "the axles or shafts of the driving wheels, or fly wheel or fly "wheels, the circular motion or rotation is completed."

[*Printed, 4d. No Drawings.*]

A.D. 1860, March 16.—N° 700. (* *)

LAIRD, JOHN.—(*Provisional protection only.*)—" Improvements " in effecting the exhaustion of steam-engine condensers."

This invention relates to the application of rotatory pumps for effecting the exhaustion of air, water, and vapours from steam condensers. In this way the ordinary air pump is dispensed with. " It is preferred to use . . . rotatory or centrifugal pumps, such " as those known as Gwynne's or Appold's, but various forms or " arrangements will answer the required end, the pumps being " driven either by the engine itself or by a separate mover."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 17.—N° 710. (* *)

BROTHERHOOD, PETER.—" An improved method of gene- " rating steam " in locomotive, stationary, marine, or any other form of steam boiler. The invention consists in taking a portion of steam from the boiler, and passing it by means of a pump or other suitable forcing apparatus through a superheater connected with a smoke box or with a furnace. In its passage through the superheating apparatus the steam will be raised to a high degree of temperature, in which state it will be returned into the boiler through a perforated pipe or pipes, arranged and disposed at the lowest part of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 19.—N° 715.

ELLIS, JOHN, WINTERBOTTOM, WILLIAM, and BRADOCK, JOHN.—Improvements in steam engines. This invention relates to an equilibrium valve, which combines a slide valve and steam chest: its transverse section is a right angle triangle, the hypothenuse and ends being exposed to the atmosphere: within the valve there is a transverse partition which divides it into two compartments: the valve seating on the cylinder is provided with ports of admission and emission as usual; a hollow is sunk in the valve surface for the expulsion of exhaust steam, and a suitably timed opening out of each compartment supplies and cuts off the steam on its passage from the valve to the cylinder. Projecting from the cylinder at right angles along one aide of the valve seating, there is a flange of corresponding length and breadth, through

which the steam is supplied alternately through corresponding openings into the separate compartments of the valve, by a pipe fixed to the outside; the valve is kept in its place by loose adjustable metal strips, fitted along the plain side of the valve seating and the outer edge of the face of the flange; no stuffing box is required for the valve spindle, which is fixed to the end of the valve, to which also a lubricator is fitted, which by degrees discharges its contents into the valve through a hollow spindle screwed into the metal.

[Printed, 8*d*. Drawing.]

A.D. 1860, March 21.—N° 732.

SYKES, Thomas, SYKES, Benjamin Clifford, and CROSSLEY, James William.—This invention relates to heating water, air, and other fluids, generating and superheating steam, preventing incrustation in steam boilers, and consuming smoke. Consists—1. In casting metal upon wrought iron or other metal tubing bent in a spiral or other form, whereby continuous water channels within the solid metal of thick cylindrical shells, or in flat or curved plates, are formed, portions of tubing being left projecting for the purposes of attachment. Also, fitting one metal cylinder within another upon which a spiral groove has been cut, and fastening the two together for the same purpose. Also, connecting flat or curved plates face to face, whereon serpentine or zig-zag passages have been formed; both sides of these cylinders or plates are subjected to the action of fire, whereby the fluids in the channels become quickly heated and a circulation thereof maintained. The water or steam is discharged into a vertical egg-shaped vessel by a suitably formed pipe within another pipe, wherein the steam is superheated and conveyed to the engine. The dirt deposited at the lower part of the vessel is blown off through a tap and pipe fixed thereto. The feed water is heated by coiling and passing the pipe through the lower section of the vessel. 2. Using such channelled cylinders and plates as auxiliaries to Cornish and other boilers, by placing them in the flues, so as to expose both surfaces to the action of the fire-draught. 3. Constructing upon a horizontal cylindrical boiler a steam chamber, and to the under side a dirt chamber, wherein the feed pipe is spirally coiled; the body of the boiler is filled with fire-flues attached to a water space at one end of the boiler, and so

connected as to form a continuous passage for the fire-draught. Water pipes run through the fire-flues open to the feed and the body of the boiler. Concentric cylinders or plates in connection with the feed may be placed in the fire-flues. 4. Constructing boilers with concentric tubes. The central is a fire-tube, the annular space within the surrounding tube is the water space, which is externally and internally exposed to the fire-draught. 5. Constructing furnaces or fire-boxes in two compartments by means of a mid-feather, so that each part shall be separately employed, the flame division in coking the green coal, while the other effects the combustion of the gases and smoke evolved therefrom; the fire-bars, which are placed across the furnace, are hollow and open at one end, where the cold air enters and passes out through slits in their sides beneath the combustion division.

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1860, March 21.—N° 739.

PHILLIPS, John Davis.—(*Provisional protection only.*)—
"Relates to the employment of a peculiar apparatus in lieu of the
"air pump at present employed in condensing engines, and con-
"sists in the application and use of apparatus similar to that now
"known as 'Giffard's Feed Injector,' for the purpose of removing
"the water from the condenser and conveying it to the hot well.
"In carrying out this invention in practise it is proposed to
"apply a branch pipe of the 'injector,' but which is in this case
"an ejector to the bottom of any ordinary or other condenser, so
"that on a jet of steam being admitted into the ejector the water
"in the condenser will be drawn out and forced into the hot well
"with which the ejector is in communication. A branch steam
"pipe opens into the condenser for the purpose of forming a
"vacuum therein on first starting the engine, by which means the
"ordinary injection jet of cold water, and the ejection apparatus
"for conveying such water to the hot-well may be put into
"operation before the engine itself is started."

[Printed, 4*d.* No Drawings.]

A.D. 1860, March 22.—N° 744.

BELL, John Smith.—(*Letters Patent granted to Robert Bell, his administrator.*)—This invention relates to steam engines and boilers. A high-pressure cylinder is placed concentric within a low-pres-

sure cylinder; the high pressure piston is of the ordinary construction, actuating a connecting rod coupled to the central throw of a three-throw crank shaft; the piston of the low-pressure cylinder is annular, with two piston rods disposed in a line with the centre, and their two connecting rods are coupled to the outer throws of the crank which are opposite to the central throw; the whole three being on a plane with the centre of the crank shaft, or to prevent dwelling on dead centres, the central throw may be 2° in advance of the outer ones; the effect being that the low-pressure piston is turning the top centre while the high-pressure is within 2° of turning the bottom centre, the one ascending while the other is descending, and vice versa, thereby confining the strain to the engine by counteraction. Only one slide valve is employed to each pair of high and low-pressure cylinders, viz., for admitting steam to the high-pressure piston, transmitting it to the low-pressure piston, and conducting it to the condenser. Expansion slides are fitted to the main slide valve. It is proposed to pass part of the injection water of the condenser through a refrigerator of the ordinary construction, to be returned and re-employed for condensing, the other part being pumped into the boiler. The boilers are constructed for marine purposes, the backs, tops, and fronts being hemispherical or curved. Above the water space which covers the furnace there is a chamber filled with vertical water tubes, which form a water communication with the upper part of the boiler; the flaming gases after passing from the two furnaces to the back of the boiler return through the chamber amongst the vertical water tubes, and thence through a series of vertical fire-tubes arranged within the steam space; the tube plate and lower ends of these tubes are below the water lever; the upper ends of the tubes superheat the steam and open to the chimney.

[Printed, 10*d*. Drawing.]

A.D. 1860, March 23.—N° 756.

WATTS, Joel.—This invention relates to so constructing safety valves that they cannot be tampered with or overloaded. The valve is duplex, consisting of two valves one above the other, and two valve seats contained in a covered valve box perforated at top for the escape of steam. The top valve is pressed down on its seat by a helical spring compressed by a flange screwed down a thread cut on the upper end of a vertical spindle, above which is

a set nut. The extreme upper end of the spindle enters a central recess in the top of the box; the top valve slides up the spindle when raised by excessive pressure. In the body of the lower valve, which is fixed on the lower end of the spindle, there are openings through which the steam at all times has access to the top valve, but in the seating of the lower valve, which closes upwards, there are passages leading to the upper part of the valve box, through which the steam escapes whenever any attempt is made to force down the flange or spindle by means of a rod or anything else passed through the escape openings in the top of the box. Several modifications of the duplex valve are shown and explained.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, March 26.—N° 779.

GOURLAY, Henry, and KEMP, Ebenezer.—"Steam engines "and boilers." Relates:—1. To compounding one low and two high-pressure cylinders to work with one piston on a trunk. The two high-pressure cylinders are respectively placed at each end of and concentric with a central low-pressure cylinder; the trunk slides easily into the high-pressure cylinders, passing through a stuffing box at each end of the low-pressure cylinder. It carries the low-pressure piston on the middle of its length, and is fitted with piston packings round its ends, which act as the high-pressure pistons, each receiving steam and giving off power in one direction only, so that the two ends of the trunk only constitute one piston. The steam valves and passages are so arranged that the exhaust steam from the high-pressure cylinders shall operate alternately on the return sides of the low-pressure piston. The piston rod is attached to the end of the trunk, and works through a stuffing box in the end of one of the high-pressure cylinders.

2. Employing chambers placed above each other a suitable distance apart and connecting them with vertical water tubes. The lower chamber is semi-cylindrical, the flat part upwards, which is enclosed by a perforated tube plate; the second chamber is flat, the top and bottom of which are perforated tube plates; the third chamber is of the same form as the first, the tube plate facing downwards. These chambers are connected by groups of vertical tubes; their ends are rivetted to the inner sides of a vertical square double casing, which forms a surrounding water space. The

furnace is beneath the lower chamber. The top semi-cylindrical chamber is connected by a short tube with a cylindrical steam chamber above, upon which, rising through the top of the casing, the steam dome is placed; the hot fire draught rises up the sides of the chambers, and is made to pass transversely between the water tubes.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1860, March 28.—N° 796.

WEEMS, JOHN.—This invention relates to the construction of cylindrical vertical boilers, containing one or more central, or a group of tubes, closed at their upper ends by fire-clay or metal plates or caps, or a range of tubes in horizontal boilers, closed in the same manner to form receptacles of heat, such tubes extending from top to bottom of boilers of either description, which are supported on legs formed of tubes opening into the bottoms of boilers, but closed at their lower ends or feet; all organic or calcareous matter deposited by the water sinks into these tubular legs, and is drawn off through stop cocks fitted thereto; the scum from the surface of the water is also received in a scum dish, whence a pipe conveys it down to the tubular legs to be drawn off; these boilers are entirely encased within brickwork flues, or metal casing lined with fire-clay. The heated gases rise from the furnace beneath into the vertical tubes, where the coloric is absorbed by the water inside the boiler up to the water level, and by the steam above, which is thus superheated. The hot fire draught (which has no passage through the tubes) after circulating round the external flues passes off to the chimney; the steam pipe and safety valve are attached to the crown or upper parts of these boilers. Several modifications are shown. For ventilating or heating buildings, vertical boilers filled with small tubes with water spaces between are described, the air is heated by passing up the tubes; neither the top or bottom of the boiler is in communication with the furnace (which is arranged at the side) or with the flues, which only conduct the fire draught round the sides of the heating apparatus.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, March 31.—N° 830.

CLARK, DANIEL KINNEAR.—Steam engines and boilers. Relates to—1. Heating *feed-water within* a chamber or vessel by directing

the blast of exhaust steam into contact therewith at the moment when the water is divided into thin sheets, or films, drops or sprays. Also heating metallic surfaces disposed within a vessel in the form of diaphragms, fins, helices, &c., by blowing exhaust steam through such vessels, and distributing feed water in fine particles upon such heated surfaces. Also discharging steam and feed water upon perforated surfaces within a vessel, in order that the water may mix with the steam, by the force of which it is driven through the perforations in the plates; the thus heated feed water accumulates in the bottom of the vessel, whence it is pumped into the boiler. Reference is made to a patent granted to this inventor in the year 1859, Nº 813.

In surface water heaters, causing the steam to advance helically or by alternate deflection, and impinge upon the heating surface.

2. To effect the combustion of fuel and the prevention of smoke by regulating and supplying steam and air independently of each other; by shutting the air valve and blowing steam over the surface of the fire the draught may be increased or diminished according to the direction given to the steam, and the fire be damped or stimulated at pleasure. Another patent granted to this inventor dated November 13, 1857, Nº 2976, is referred to. In locomotives the above effects are produced by directing powerful jets of steam into the throat of the furnace clear above the fuel, in other boilers the draught may be stimulated by jets of steam issuing from bridges or partitions in the flues near the end of the furnace.

Improving the air draught by placing the fire bars of a furnace, or placing plates in the ash-pit, in a transverse direction to such draught; also drawing air by jets of steam into closed ash-pits for the purposes of combustion.

3. Blowing jets of exhaust or fresh steam against the current of hot gases in boiler flues for the purpose of baffling the draught and detaining and causing the hot gases to impinge upon the heating surfaces.

4. "Drying and superheating steam, or of separating priming "water by the application of helices" or "diaphragms, or "agitators, or jets of steam of greater pressure in the pipes or "passages through which the steam is passed for that purpose to "impinge it on the surface of the pipes or passages, and promote "*the precipitation of* water and the absorption of heat."

5. The forcible introduction of thin sheets of water into *condensers; also* "the application to surface condensers of

"alternating diaphragms, or equivalent means of impinging the "steam on the condensing surface to promote its condensation, "and the external impingement of condensing water in thin "sheets, or otherwise, on the surface for the same object."

[Printed, 1*s*. Drawing.]

A.D 1860, March 31.—N° 836. (* *)

JEFFERSON, RICHARD ALFRED, and JEFFERSON, MATTHEW, —"An improved construction of steam engine, applicable also to "the raising of water."

"This invention of a novel construction of rotary steam engine "relates principally to the manner in which the slides are fixed "to the covers, and the form of the cylinder rendered necessary "to work therewith, there being four slides passing through the "covers and meeting together within the cylinder, two and two "alternately, forming steam-tight abutments, also two latteral "cams fixed on the central axle to withdraw and replace the "slides, and the arrangement of the brasses for keeping the axle "permanently in its place, by which combination we have an "engine of the same power in all positions of the piston, and "without any loss of steam."

Used as a pump the arrangement will be the same, making the injection or ejection ways as large as possible, and driving it by a pulley fixed on the central axle.

[Printed, 10*d*. Drawings.]

A.D. 1860, April 3.—N° 853.

JONES, JOHN MASTERS.—(*Provisional protection only.*)—Generating steam by boilers constructed about those parts exposed to the fire draught with corrugated plates, so as to form "annular or partially annular or other shaped grooves, recesses, "or channels" thereby to increase their amount of heating surface; also fitting heating tubes into the bottom of a boiler, which tubes are bent to pass out horizontally through the end of the boiler below the water level.

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 3.—N° 858.

HOPE, DAVID GRAHAM.—(*Provisional protection only.*)—Slide *valves, and the gearing for* working them, which "consists of a

" combination of a single excentric with rod, reversing link,
" valve rod, and hanging link." " The excentric, which is set at
" right angle with the crank works a valve without lap or lead,
" and the reverse motion is obtained by fixing the centre of the
" reversing link to the reversing shaft arm, the excentric rod
" being coupled to one end of the reversing link, and such end
" may represent either fore gear or back gear, and as the centre
" of the link is fixed, so far as the slide valve is concerned, the
" other end represents the opposite gear." Another valve arranged upon the back of the valve referred to above "consists of a plain
" piece of metal having a wedge-shaped recess, and in this recess
" there is a wedge, which may be brought down to prevent any
" movement in the back valve, and so that such back valve may
" cut off steam almost as soon as the first valve moves by lifting
" the wedge, and thereby allowing the back valve more play, and
" the degree of expansion may thus be varied to any required
" amount."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 4.—N° 862.

PULLAN, Abraham, and CRESSWELL, Thomas.—Gauges applicable to steam boilers, for indicating the water level and steam pressure. These gauges have a peculiar arrangement of steam and water chambers, and passages commanded by a "three " way cock;" the water chamber has a polished reflector at back, and a glass front, through which the height of the water is seen when admitted upwards from the boiler through a central passage in the cock, which also at the same time opens a steam way to admit steam to the upper part of the chamber, into which the bulb of a thermometer descends, for the purpose of ascertaining on the scale above, the temperature, and consequently the pressure of steam. The third way in the cock opens a passage to empty the gauge. A steam whistle to signalize shortness of water is attached to the gauge. Also to test the condition of the water in marine boilers, which in a boiling state is admitted to a box to surround the bulb of a thermometer, which will show the temperature of the water, and at the same time indicate the strength of the saline contents. The gauge passages are cleaned by a spindle. Many modifications are shown and explained.

[Printed, 1*s*. Drawing.]

A.D. 1860, April 5.—N° 877.

NEWTON, ALFRED VINCENT.—(*A communication from Lucius J. Knowles.*)—The so arranging "the valves and steam ways of "pumping engines for feeding steam boilers, that the engine "may start itself automatically whenever steam is admitted to "to the steam chest, and whatever may be the position in which "the piston or the valves are left." Attached to the back of the slide valve is a hollow cylinder or "plunger," which slides longitudinally in a cylindrical "chamber" or channel bored for that purpose in the steam chest; set above the main steam chest is an auxiliary steam chest and slide valve, the rod of which is actuated by an arm fixed on the piston rod when near the end of its traverse, by alternate contact with two pairs of stop and set nuts a regulated distance apart on the valve rod, thereby suddenly operating the auxiliary valve, which "governs inlet and outlet "steam passages to and from the cylindrical chamber in which "the hollow plunger works, and by its movements directs steam "alternately to the opposite ends of the plunger, thereby causing "the plunger to slide endways in its chamber, and operate the "main valve." The ends of the plunger are recessed to make space for the water produced by condensation at the ends of the chamber.

[Printed, 8*d*. Drawing.]

A.D. 1860, April 9.—N° 891.

AVELING, THOMAS.—This invention relates to steering apparatus for locomotive or traction engines, which consists of a pair of horse shafts attached in the usual way to the fore carriage, for ordinary use when the engine is drawn by horse power, but when made locomotive, a cross bar of wood or iron is secured by staples or otherwise to the fore ends of the shafts, central between which, at the front of the bar, is fixed a vertical coupling block to sustain a vertical spindle which at the lower end is forked to receive a guiding wheel; the upper part of this spindle is kept in position by back stays attached to the two shafts. The guiding wheel, the felloe of which is formed to cut into the ground, is operated by a long horizontal steering lever, which carries a transverse segmental handle at its free end. The other end of the lever is fixed to the top of the spindle. By means of this segmental bar, which is fitted at intervals in its length with

handles, a considerable range of action can be imparted to the steering lever by the steersman without moving from his central position on the engine platform. Other means may be devised and employed for directing the course of the guiding wheel. If necessary two guiding wheels with edged peripheries may be mounted on studs projecting laterally from the base of the vertical spindle.

[Printed, 8*d*. Drawing.]

A.D. 1860, April 10.—N° 898.

NEWTON, William Edward.—(*A communication from Benjamin Normand.*)—Superheating steam. A small boiler, capable of producing high-pressure steam, is placed beneath a superheating cylindrical chamber containing a group of longitudinal tubes a suitable distance apart; the steam from the small boiler passes through short open connecting pipes into the body of the superheater, filling the space between the tubes, which receive low-pressure steam at one end from a boiler placed conveniently near. The other ends of the tubes open into a pipe, which conveys steam generated in the low-pressure boiler from the superheater to the engine. The water produced by the condensation of the high-pressure steam on the surface of the tubes in the superheater, by reason of the low-pressure steam containing the lesser degree of heat, runs back to the small boiler, which, except there be an escape through the safety valve, will require very little further supply. Both ends of the superheater are flanged round; cast metal diminishing chambers are bolted thereto for connection with the steam pipes.

[Printed, 8*d*. Drawing.]

A.D. 1860, April 13.—N° 930. (* *)

EDWARDS, Thomas.—(*Provisional protection only.*)—"Improvements in obtaining motive power."

This invention consists in obtaining motive power by employing the pressure of steam, air, gases, or fluids of any kind to act on a revolving piston within a cylinder. "This piston is "provided with two metallic packing strips forming a line of "contact with the opposite sides of the interior of the cylinder, "one of such lines of contact being formed on the abutment side "*of the piston,* and the other on the pressure or power-exerting "*side of the piston.* The axis or shaft of the rotatory piston is

"placed eccentrically within the cylinder, and the cylinder ac-
"commodates itself to the changing motions of the piston in its
"revolving or circular motion. The medium or agent employed
"for obtaining the requisite pressure is admitted by a suitable
"divided passage cast in the shaft, each compartment communi-
"cating by an opening or passage with either side of the revolving
"piston."

[Printed, 4d. No Drawings.]

A.D. 1860, April 14.—N° 938.

BOULARD, Laurent Marie.—This invention relates to a mode of furnishing the interiors of steam boilers with a lining of pierced sheet metal, metallic gauze, or non-metallic tissue, for the purpose of catching all calcareous and organic deposits before they reach the boiler shell, furnace, and flue plates; these linings, which should be of finer texture over the furnace and flues, are kept from contact therewith by small bracket packings. Instead of a lining, the metallic gauze or tissue may be arranged (for the convenience of removal) to form shelves or troughs within the boiler, upon which the deposit will fall, the object being to prevent incrustation.

[Printed, 4d. No Drawings.]

A.D. 1860, April 14.—N° 941.

FISHER, Thomas, and FISHER, Edward.—(*Provisional protection only.*)—"This invention consists of certain improvements
"in steam engines on the condensing principle, by which we pro-
"pose to dispense with the air pump, head-valve, and head-box
"to the condensing cylinder." "We employ one steam cylinder
"only with a pair of condensing vaults or cylinders. These
"vaults or cylinders we clear by a jet of steam instead of by the
"aid of the air pump. By the use of these two cylinders or
"vaults we catch the vacuum at each half stroke of the engine;
"an exhaust being produced in each condensing cylinder
"alternately."

[Printed, 4d. No Drawings.]

A.D. 1860, April 14.—N° 945.

PARTRIDGE, David.—(*Provisional protection only.*)—Super-heating steam "*relates to those* apparatuses in which flame or the

"products of combustion or other heating gases are caused to "travel through, between, or among tubes, spaces, or vessels con- "taining steam, in order to dry, or, as it is termed, superheat "the same; and my invention consists in the adaptation to such "apparatuses of one or more dampers or valves in order to regu- "late the draught through the same, whereby the temperature of "the superheated steam can be regulated at will."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 16.—N° 951.

WALKER, Thomas.—"Apparatus for indicating the height of "water in steam boilers," which consists in fixing a narrow steam-tight chamber on the top of the boiler, of such a form as will allow space for a horizontal lever arm to work up and down therein, to the end of which a float is suspended by a rod and link; one end of the lever axis or pin works in a bush screwed into the side of the chamber, the other end works through a bush and stuffing-box on the other side, projecting therefrom, and carrying a pointer to indicate on an external graduated index the height of the water level. A steam whistle is fixed on the top of the chamber, from which a vertical rod descends through a small gland into the chamber. When the water level is too low, a fixed stud on the float link strikes a projection on the vertical rod which opens the whistle valve and gives signals of danger.

[Printed, 6*d*. Drawing.]

A.D. 1860, April 17.—N° 967.

BRIDGETT, William. — "Regeneration and expansion of steam."

After steam is generated in a boiler, it is conducted through tubes into chambers placed in the "take-up" at the end of the boiler, "in order that it may be heated therein by the heat" which is passing therethrough to the chimney; "this heat regenerates "the steam and expands it." The heating chambers may be extended into the flues through curved pipes around the boilers and through the "take-up," such pipes being bent up and down or from side to side in order to present an increased amount of heating surface. Groups of pipes, wherein the passing steam is superheated on its passage to the engine, are also used in connection with the chambers in the "take-up."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1860, April 21.—N° 1000.

BUTLIN, William.—This invention relates to superheating steam and heating feed water; it is applicable to tubular marine boilers and to the boilers of locomotive and portable engines. Consists in placing a narrow heating tube chamber within the smoke box across the tube plate, so that the mouths of the tubes in the chamber shall coincide and form an exact continuation of the fire tubes of the boiler. "If intended for superheating steam, "the upper part of this chamber is placed in communication by "means of a pipe on one side with the steam space in the boiler, "and on the other side with a pipe, through which the super-"heated steam is conveyed to the cylinders of the steam engine." Saturated steam can be admitted into the passage pipe of the superheated steam when required by means of a screw valve mounted thereon. When the tube chamber in the smoke box is used to heat feed water, it is made to enter from the pumps at one end, and after passing amongst the tubes it discharges at the other end through a pipe in communication with the lower parts of the boiler. Instead of one heating tube chamber, the use of two or more may be found more convenient.

[Printed, 8d. Drawing.]

A.D. 1860, April 21.—N° 1001.

MACNAB, William.—This invention comprehends,—

1st. A design for the arrangement and position of the parts of marine engines of the oscillating cylinder class. The "cylinders "and various other parts are placed within a rectangular base "or space, the surface condenser being placed at one side of "this base. The cylinders occupy the opposite ends of the "rectangular space, having between them the air pumps and "the pumps for forcing the condensing sea water through the "condenser. The base plate or casting occupying the floor of "the rectangular space is formed with seats for the pumps, "and passages to and from them, also with the usual bearings "for the cylinder trunnions, both cylinders exhausting through "their inside trunnions or bearings into a single passage leading "over with a bend to the condenser. The parts are so arranged "that the surface condenser can be converted into an ordinary "condenser, or be removed and an ordinary one substituted."

2nd. The arrangement of surface condensing tubes placed within the condenser either horizontally or vertically in frames containing small groups, which are screwed or soldered into the tube plates. The condensing water may be made to flow either inside or between the tubes alternately in opposite or in cross directions by means of partitions. To provide for expansion and contraction, elastic packings are used between the tube plates and frames, or against the inner sides of the condensing chamber when fixed thereto. "A number of the sets of tubes" "may be arranged across the "part of the condenser at which the steam enters, or across the "exhaust passage or pipe, and through these tubes the water of "condensation may be made to pass on its way to the boiler, so "as to take up and utilise some of the heat of the steam about to "be condensed."

3rd. Providing an auxiliary boiler for generating steam at a low pressure and condensing it for use, to make up for loss by waste and leakage and supply vessels with fresh water for cooking and other purposes; "the steam thus produced is elevated to a high "temperature by means of arrangements for superheating it in "connection with the auxiliary boiler or boilers," and is "then "passed into the jackets surrounding the cylinders, valve casings, "and other parts of the engines previously to passing to the distil- "ling or condensing apparatus."

[Printed, 10*d*. Drawing.]

A.D. 1860, April 21.—N° 1007.

HARVEY, John.—"Improvements in safety valves," which consist in applying an "ordinary fusible metal plug" in a plug box fixed close above the top of a boiler entirely filled with water, or close above the water level of a boiler only partially filled. A down pipe leads from the plug box to the bottom of the boiler, for the purpose of conveying heat to the plug when the water is raised to a dangerous temperature; the plug box above the fusible plug opens to the atmosphere through a tube. By these means the plug is melted, and the water and steam escape upwards through the tube, the top of which is capped over to prevent a perilous spreading of the boiling liquid.

[*Printed*, 10*d*. Drawing.]

A.D. 1860, April 23.—N° 1009. (* *)

DATICHY, Florimond.—(*Provisional protection only.*)—" Im-
" provements in apparatus for utilising the waste steam of steam
" engines."

" I conduct the waste steam from the engine through a pipe " which leads to a receiver enclosed in a water-jacket or casing, " on the top of which receiver is a constant shower of cold water, " which causes a slight condensation of the steam, which is then " withdrawn by means of a pump attached to the engine, which " forces it into vertical tubes on each side of the furnace, where " it is subjected to the heat of a surrounding cylinder, the effect " of which is that it is forced again into the boiler for further " use."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 26.—N° 1046. (* *)

ROBERTSON, Andrew.—(*Provisional protection only.*)—" Im-
" provements in steam boiler furnaces."

" The fire-grate for the evolution of the heat is situated apart " from the boiler, and the fire-gases are admitted into the upper " part of a chamber," " wherein the heat is to be applied to the " boiler. According to one modification, the chamber consti- " tutes a kind of oven surrounding the boiler up to within a " few inches of the water line, and is made of sufficient size, as " compared with the outlet passage for the fire-gases, to insure " these being kept for a considerable time in contact with the " boiler surface, and to cause as it were an accumulation of heat " in the chamber. The outlet from the chamber for the fire-gases " is situated at the lowest part of the chamber, and at the point " most distant from the furnace."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 26.—N° 1049.

WRIGHT, James.—(*A communication from Horace Gray.*)—(*Provisional protection only.*)—This invention relates to the prevention of incrustation in steam boilers using sea, calcareous, or other impure water. Discovers that the solubility of deposits from such waters decreases with increase of temperature, and at *300° Fah. they are insoluble,* mechanically mixed with the water,

and settle to the bottom, in which state they can be blown off in the usual manner. A separate vessel is used called a "separator, " placed either within or in communication with the boiler, so " that it can be heated by the steam from the boiler, and conse- " quently kept at the same temperature as the latter, which, as " before mentioned, should be about 300° Fah. The feed water " is pumped into this separator, and is thus heated by the steam " from the boiler (not by the direct impinging heat of fire) until " raised to the before mentioned temperature, when the deposits " are rendered insoluable, and, falling to the bottom, may be " driven off by the blow-off cocks in the usual manner, as they " do not adhere but form a loose sediment. The purified water " rising over the side of the separator falls into the boiler, giving " it a continuous supply."

[Printed, *4d.* No Drawings.]

A.D. 1860, April 30.—Nº 1088.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Edward N. Dickerson.*)—This invention effects without concussion or injury the rapid closing of the independent cut-off valves of marine engines at any point of the stroke. Mounted upon the valve case of a single poppet valve is a socket, in which a vertical plunger attached by a lateral arm to the valve rod works up and down parallel therewith; the lower end of the plunger is hemispherical, and the bottom of the socket which contains some liquid is formed to receive it. A cam upon the main shaft, acting upon a bowl at the end of a fixed lever, by means of a connecting rod and a bell crank lever, lifts a catch rod twice every revolution. A projecting catch is formed at the top of the valve rod facing downwards, which, when the valve is about to lift, is operated by a similar catch facing upward at the lower end of the catch rod, and an escapement is effected by means of a roller fitted in the end of an adjusting lever arm coming in contact with a projecting incline on the side of the catch rod. The plunger having to displace the liquid in the socket, prevents any bruising of the seating or surfaces when the valve falls. The position of the adjusting lever can be set to drop the valve and cut off at any part of the stroke.

[Printed, 6d. Drawing].

A.D. 1860, April 30.—N° 1093.

BENNETT, JAMES HENRY.—" Combined direct-action balance " safety valves," doubling the effective area of safety valves by so placing two or more valves that they shall be drawn together on their seatings by the force which resists the pressure of the steam acting upon them in the opposite direction. A valve chamber, furnished with one valve at the top and two valves below, is fixed on the boiler; the steam pressure acts under the upper valve, which opens upwards, and upon the lower valves, which open downwards; the latter are fitted in valve boxes projecting at opposite sides near the bottom of the chamber, the under surface of the top valve and the upper surfaces of the lower valves being exposed to the steam. A crosshead is attached to the spindle of the upper valve, and an annular crosshead to the spindles of the two lower valves. These crossheads are drawn together by spring balance gauges made on the same principle as " Salter's " gauges." " It is not positively necessary that the valves agree " in area, but if they do it will form a check upon their accuracy."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 1.—N° 1098.

BOWER, GEORGE. — " Improvements in metallic pistons." Consists in expanding the internal V-edged rings of metallic pistons by means of screws which have plain tapering ends; three or more of such screws are tapped equidistant through the piston cover or bottom so that their tapering ends shall act as wedges within the piston to press outwards against blocks cast upon the internal piston ring, and " by expanding and forcing it outwards, " by means of such screws the packing rings of the piston are " kept in steam-tight contact with the interior of the cylinder."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 2.—N° 1109.

SILVER, THOMAS. — (*Letters Patent void for want of Final Specification.*)— Relates to the disposition of engines on board vessels, particularly screw steamers, in order to prevent the mischievous effects of tortional vibrations in such vessels caused by the changes in the direction of the strain by the engines, as their power is alternately opposed to the medium of resistance.

The invention consists in disposing the cylinders fore and aft the ship, the motions of the pistons being parallel with the line of the keel, and actuating a short transverse crank shaft which gives motion to the propeller shaft by bevelled gearing. When two screws are employed, one immediately in advance of the other upon the same centre, one solid shaft is used within the other which is tubular; a bevel wheel is fixed on the end of each shaft which gears into wheels on the crank shaft. In driving a single screw the ordinary thrust box is dispensed with, the back pressure of the screw being received on discs attached to the bevel gearing.

In some vessels the cylinders, instead of being placed as above described, are placed horizontally above each other.

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 3.—N° 1112.

NORMANDY, Alphonse René Le Mire.—(*Provisional protection only.*)—Fixing the ends of tubes in multitubular boilers "by means of stuffing boxes, by preference with a packing of "vulcanized india-rubber, but other material may be used. The "ends of the tubular flues pass through holes in the plates in "which they are to be fixed, and a recess is produced around "each end by means of a collar fixed or applied to the plate "around the end of the tubular flue, the collar being large "enough to receive the packing. Over this a gland is fixed by "screw bolts, such gland consisting of a disc with a hole through "it, through which the end of the tubular flue can pass, and it "presses a metal ring into the collar, so as to compress the "packing of vulcanized india-rubber or other material, or the "gland may be made all in one piece."

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 9.—N° 1151.

JOHNSON, William Beckett.—Steam engines and boilers.

This invention relates to making certain parts of the framing for horizontal engines hollow or box form, and using such hollow boxes for the condensing chamber and hot well; the piston rod mounting, works between the hollow chambers, which are above and below the piston rod, and carry its guides. The upper chamber is the hot well, and the lower one the condenser. The air pump rod is attached to the piston rod mounting, the pump

being in a line with the cylinder. The connecting rod is made with two prongs, which work on studs at opposite sides of the mounting, and so clear the air pump.

Placing the cylinders of a horizontal engine on the top of the condenser, wherein the air pump is placed; the pump rod is connected to a bell crank lever, made to vibrate by means of a rod connected to the crank pin.

Connecting the pistons of two cylinders to one crosshead, to which the connecting rod is made fast: the cross head is mounted in journals carried by the piston rod.

Injecting water into a condenser by means of two tubes, one acting as a plug within the other, through which the water is forced. Through the metal of each tube there are longitudinal slits, or narrow openings, through which when coincident or otherwise the water is admitted or stopped off.

Forming the seatings of delivery valves with two rectangular openings, and using a flexible lid, such as india-rubber, which is fixed down by a bar along its centre upon the seating between the openings, the sides being left free to lift.

Constructing boilers with a furnace at each end and a central combustion chamber, out of which the hot draught issues by a descending opening made through the bottom of the boiler.

Placing two boilers end to end, leaving a space between them to form a combustion chamber with a downward flue.

Fixing the cylinder of an air pump in a central line with the cylinder of a force pump, between which the connecting rod mounting is fixed, so that one piston rod shall act for both; the pump is made double-acting by fitting two valves to the feed, and two to the delivery pipes.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1860, May 10.—N° 1155.

BOYMAN, Richard Boyman.—This invention, for applying steam or other expansive prime movers by impulse or action for obtaining rotary motion, and by reaction, for the propulsion of vessels, locomotives, and aërial machines, consists in the use of a wheel the periphery of which is furnished with buckets or open chambers of a suitable form, and the driving of such wheel round on its axis, by directing into the buckets the intermittent force of steam *or other expansive prime* mover, and thereby obtaining con-

tinuous rotary motion. The expansion of the prime mover, say steam, must be prevented as much as possible until its issue, for which purpose one or more "puff or intermittent force chambers" are arranged to hold the required quantity of steam for each issue. The issue or puff valves, which are designed on the piston principle, must open at once; the puff chambers are arranged horizontally in the funnel, whence the steam acts as a blast. The steam may be superheated in its passage to the puff chambers. When the principle of reaction is applied for the purposes of propulsion a "rotary equilibrium reaction valve" is used for driving in connection with a starting reaction valve. The inventor says "intermittent reaction propulsion" is founded on the hypothesis that "force can change its form but cannot destroy itself," and he deduces therefrom that "a foot of steam issuing into the air must "necessarily give out the same force, and be capable of doing the "same work, as the same quantity and area expanded in a cylinder, "more, indeed, because the friction of the issue would be less. "Since, then, action and reaction are equal, and contrary, this "force and work can be obtained for propulsion without any "engines or propellers whatever." The inventor further maintains that the action or impulse, or the reaction of steam applied intermittently is the true principle for its use, and that that is the reason why the attempts of Hero, Watt, Brunel, Ruthven, Pilbrow, himself, and others have hitherto failed, who all applied it in a continuous current. The Specification forms a mathematical, dynamical, and hypothetical treatise on the intermittent application of steam and extends to 57 pages of letterpress, respecting which, in the space allowed for an abridgment, it is impossible to do more than convey an outline of the principles involved in the invention.

[Printed, 3*s.* 4*d.* Drawings.]

A.D. 1860, May 11.—N° 1159.

DOERING, FREDERICK BERNHARD.—(*Provisional protection only.*)—The object of this invention is to regulate the speed of marine engines by hydrostatic pressure, in such a manner that as the stern of the vessel dips and rises, a uniform speed of the screw shall be constantly maintained. "At the stern of the vessel, and "near the bottom at the sides are placed pipes or tubes com- "municating with a cylinder open at top, in which is a piston and

" rod. On the piston rod (between a guard or guide and the " piston) is placed a spiral spring hereafter described; the upper " end of the piston rod is jointed and communicates with a throttle " valve in the steam pipe through the medium of rods and levers." When the stern of the vessel dips deep in the water the piston is simultaneously raised by the upward pressure in the pipes, and the valve is opened to its fullest extent; the contrary effect takes place when the pressure diminishes as the stern rises, and the piston descends assisted by the pressure of the spring. " In place " of a spring compressed air may be applied by forming the upper " part of the cylinder into a closed air chamber, and regulating " the pressure of the air by a force pump and guage."

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 12.—N° 1180.

PULLAN, Abraham, CRESSWELL, Thomas, and LONGSTAFF, Richard.—This invention for steam generators and apparatus for superheating steam and heating feed water, relates to constructing locomotive boilers with a water space all round the bottom of the fire-box in connection with the body of the boiler, and drying or superheating the steam, which is taken out of the steam space by a pipe connected to a horizontal barrel placed in the smoke chamber on a level with the upper row of fire tubes, extending half across. The ends of small steam tubes, which pass centrally through one half the upper row of fire tubes, are fitted into this barrel. Within the furnace, opposite the upper row of fire tubes, is another barrel which extends across the whole row; this receives the ends of the small steam tubes, and communicates with another barrel in the smoke box through similar tubes which form a return passage through the other half of the fire tubes. From the last named barrel the cylinders are supplied; the barrel in the furnace is protected by a brick screen from the extreme heat of the fire. Arrangements are made for admitting feed water into the superheating apparatus when the engine is not working.

A closed mud trough rivetted along the underside of the boiler discharges its contents into the water space under the fire box.

Steam boilers for general purposes, differing in their constructive arrangements, but comprising the principles of the invention, are described. Vertical boilers are constructed with " an additional " heating chamber, which is placed horizontally over the fire-box,

" and is connected on each side with the water spaces of the " boiler, so as to obtain a perfect circulation of water throughout " the boiler. It will sometimes be found convenient to pass tubes " or chambers through this additional heating chamber, in order " to obtain a large amount of heating surface within a small " space. This boiler is also constructed with a water space under " the bottom of the fire-bars, so that all the sediment may settle " at the coolest part of the boiler." Coils of superheating pipes are used in the flues of such boilers as are set in brickwork or in casings lined with fire-brick.

Upon an ordinary boiler a long steam cylindrical chamber is placed along the top, in communication with the steam room of the boiler; a group of tubes is fitted into this chamber from end to end, through which the hot draught is made to pass for superheating purposes.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1860, May 14.—Nº 1183.

MUNTZ, William Henry, and KING, Henry.—Improvements in marine steam engines and ships' pumps. " The cross " head of the piston rod works on two vertical guide rods which " are bolted to the cylinder cover, and at the same time form " supports for the upper part of the framework which carries the " crank shaft. This part of the framework it is proposed to make " of iron or steel plates placed on edge and bolted together, so as " to give increased strength and rigidity with reduced weight. " The side rods at the ends of the cross head are connected to " one end of a half beam or lever of the second kind (at each side " of the engine), which vibrates on a fulcrum at the other end " attached to the main framework. The connecting rods are " attached to the half beams or levers at a point between the " side rods and the fulcrum, say, at about one-fourth to one-sixth " the whole length of the lever from the end where the power is " applied, the stroke of the piston being, of course, proportionably " longer than the diameter of the circle described by the crank. " The air-pump rods are attached to the lever still nearer to the " fulcrum. The slide valve and ports are on either side of the " cylinder. The slide valve is furnished with a back plate having *slightly nearer* to each other than those of the cylinder *The foot* valve and air-pump bucket are formed of

" plates of metal perforated, and covered at the top with a solid " disc of indian-rubber, which is attached thereto by a nut or screw " at its centre, and is therefore capable of assuming a concave or " cup-like form to allow of the passage of the water through the " perforations. This part of our invention is also applicable to " ships' pumps." The above arrangements are modified when it is desirable to have a low crank shaft and a long connecting rod, and the inventors propose to be able at pleasure to lower and raise the paddle crank shaft by making the framework and bearings movable; the connecting rod must then be made in two halves, capable of longitudinal expansion and contraction.

[Printed, 10*d*. Drawing.]

A.D. 1860, May 15.—N° 1196.

NEWTON, William Edward.—(*A communication from Addison Crosby, Simeon Savage, and Herman Swift Stearns.*)—Relates to valves and valve gear for steam engines.

1st. To " a valve of the oscillating kind, constructed " " with " an opening extending transversely through it, and with two " opposite faces excentric to it axis of oscillation, and fitted to a " double seat of correspondingly eccentric form, and which con- " tains opposite ports or openings, which are covered and closed " by the faces of the valve whenever the valve bears upon its " seat. This valve when used in a steam engine or other appa- " ratus (in which there is pressure of steam or other fluid) is " subject when closed to just sufficient pressure to keep it tight, " but the pressure is perfectly balanced as soon as the valve com- " mences to open, and it works entirely without friction between " its face and seat. This construction of valve may be employed " for the induction or eduction valves of steam engines, and may " also be used as a throttle or stop valve, or as a substitute for a " cock."

2nd. To " certain improved mechanism intended to be em- " ployed in combination with two induction valves, constructed " or applied according to the first part of the invention ;" " or " with two induction valves of any other suitable construction " to admit steam to opposite ends of the cylinder of a steam " engine for the purpose of effecting the induction of the steam " with such *amount of " lead "* as may be desired, and of

" liberating the valve to permit them to be closed quickly by a " spring or weight to cut off the steam from the cylinder at any " required point in the stroke of the piston under the control of " a governor, or of suitable means of adjustment at the command " of the engineer."

3rd. To " certain improved mechanism intended to be employed " in combination with two eduction valves constructed and " applied to a steam engine," " or with two eduction valves of " other construction capable of being operated by an oscillating " or rocking stem or rock shaft, whereby such valves are made to " open quickly at the commencement of the stroke of the piston " of the engine, and to remain wide open during nearly the whole " stroke, but to close so gradually as to prevent slamming, when " valves of such construction as to be liable to slam in their seats " are used."

[Printed, 10*d*. Drawing.]

A.D. 1860, May 17.—N° 1213.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Joseph Auguste Mounier and Georges Brunier.*)—(*Provisional protection only.*)—" This invention is based on an application of " the screw to the working surfaces of the cylinders and pistons " of motive engines or machinery." A spiral groove is cut round the inner surface of a steam cylinder, in which works a piston of corresponding helical form. The piston rod is threaded to the same pitch, and after having passed through the cylinder cover and stuffing box, " is maintained in a perfectly central position " by a tapped collar, in which it revolves, and which is fixed outside the stuffing box. The cylinder has induction ports opening into the ends, and is furnished with a valve box of the ordinary construction. " The steam admitted into the cylinder thus con- " structed exerts its pressure on one of the free surfaces of the " helical piston," and imparts to it rotary motion in the direction of the " convolutions of the main screw. The down stroke " completed, the second free surface " " receives in its turn the " action of the steam, the piston revolving in the opposite " direction ascends the spiral to its starting point, and so on " alternately as in ordinary engines."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 17.—N° 1218.

ROBERTSON, Andrew, and RITCHIE, Alexander.—This invention relates to steam boilers, as regards the prevention of smoke, and the construction of furnaces, chambers, and flues, in connection with the admission of jets of steam, water, and air.

1. Constantly admitting air into the furnace through an opening near the door plate through the ends of the furnace bars, the fuel being kept back by an adjustable cross guard, by which the quantity of air admitted is regulated.

2. The fire-bar bearers are made hollow to contain water or steam, which escapes through perforations in tubes placed under the spaces between the furnace bars; the burning gases pass through apertures into a combustion chamber, which is sometimes built at the back of the furnace, "in order that a too early taking-" up of heat by the boiler may not check the thorough combus-" tion or heat-yielding combination of the matters in the furnace, " that is to say, of the constituents of the fuel, water, and air." Thence the products of combustion pass into the boiler flues, which partly surround the boiler, closing in a little below the water line; a pipe is provided for admitting into the front end of the flues a small regulated quantity of air. The boiler shown is cylindrical with hemispherical ends; it rests on separate blocks; the front of the ash-pit is enclosed, air being admitted through the back.

[Printed, 10*d*. Drawing.]

A.D. 1860, May 17.—N° 1227.

CLAYTON, Nathaniel, and SHUTTLEWORTH, Joseph.—(*Provisional protection only.*)—This invention relates to portable and tractive engines, the object being to render portable engines more efficient for tractive purposes. The means employed consist in suspending the boiler about midway in its length to the main axle, which compels the advantageous use of large travelling wheels, whereby the application of the power is rendered more effective, more simple and direct. The other details and arrangements are of the ordinary kind, the invention extending only to the disposition of the boiler beneath the main axle.

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 21.—N° 1243. (* *)

BLAKELEY, THOMAS.—" Improvements in rotatory engines."

These relate to that class of rotatory engines in which the main shaft is carried through one or both of the ends, or the top and bottom of the cylinder. " The inside of one or both of the ends " or top or bottom of the cylinder is formed into a cam in which " move friction rollers, or other contrivance fastened to the piston. " The piston consists of two wings or parts secured to the centre " shaft and dividing the cylinder into two spaces, these wings " or abutments are elevated when passing the steam entrance and " exit ports by the form of the cam." This engine may be worked by steam or other elastic fluid for obtaining and transmitting power, or it may be operated by other power and used as a pump; it may also be used " as a hydraulic motive power " engine, and for exhausting and forcing air, and other fluids."

[Printed, 6d. Drawing.]

A.D. 1860, May 28.—N° 1311. (* *)

MURPHY, WILLIAM JEREMIAH.—(*Provisional protection only.*) —" An improved motive-power engine."

This engine may be driven by the elastic force of " steam, " compressed water, compressed air, or other elastic fluid." The cylinders are radially disposed within a steam-tight chamber which is placed to revolve on the end of a stationary feed pipe. " The cylinders are fitted with pistons and piston rods, " so that when steam or other elastic fluid is admitted to the " centre, it acts simultaneously on all the pistons, driving them " outwards. To the outer end of each piston rod is attached a " lever, which vibrates on a fulcrum, and is connected by a link " to the rim of the fly wheel in such a manner that as soon as " the pressure acts upon the pistons, the levers by their links pull " the fly wheel round, and as the cylinders and levers revolve " with the fly wheel, the force of the steam or other elastic fluid " is constantly forcing the fly wheel round in one direction as " long as the pressure is maintained."

[Printed, 4d. No Drawings.]

A.D. 1860, May 29.—N° 1326.

TRAYES, JOHN.—This invention relates to the construction of boilers for heating purposes and generating steam. The form of

the external shell is rectangular over-arched, and the inside shell, which constitutes a tube chamber, is the same, whereby narrow water spaces are formed at the sides, top, and ends. The bottom is open. Two parallel courses of brickwork whereon the boiler rests form the sides of the furnace. The outer shell is entirely surrounded by a narrow brick flue. The internal space is fitted with longitudinal tubes which open water communications between the boiler ends; these tubes are fixed in the end plates of the internal shell. Small fire tubes pass through the centre of the water tubes, and are fixed in the plates which form the ends of the outer shell. The burning gases rise from the furnace, playing amongst the water tubes; they then pass out through a hot draught passage to the front flue, return through the inner fire tubes to the back flue, and after expending their heat in the side and crown flues pass off to the chimney. The boiler is provided with a safety valve and damper. The heated water passes out through the crown of the boiler, through a vertical pipe, and returns by a horizontal pipe fitted to the lower part of the shell.

"Various forms of boiler shell may be used, such as 'saddle "'back,' 'haystack,' or cylindrical shells; and the tubes may be "either horizontal, vertical, or otherwise."

[Printed, 10*d*. Drawing.]

A.D. 1860, May 29.—N° 1328.

PATERSON, Alexander John.—This invention, relating to agricultural tractive engines and implements, consists, 1, in the employment of lazy-tongs in connection with agricultural operations. By preference, two sets of lazy-tongs are fitted to act at the front end of the engine in a forward direction, carrying out anchors or gripping apparatus for holding to the ground, each set alternately projecting forwards, whilst the other set is contracting or drawing home. In this manner by the progress and regress of the tongs, the machine to which the implements are attached is drawn along. The ploughs and implements are attached to suitable frames furnished with supporting and guiding wheels. The alternate extension and contraction of the two sets of tongs is effected by means of the double action of screw-threaded shafts, one to each set, transversely disposed one over the other in the fore part of the apparatus. From the centre of these shafts the

screw threads run in opposite directions, left and right handed, so that two nuts, one on each end respectively of each shaft, when the shafts are turned in one direction, simultaneously converge towards their mid-length or centre, and when turned in the other direction, diverge towards the ends. To the pair of nuts on each shaft are jointed respectively the ends of the tongs. The motion of the shafts alternates in opposite directions, so that whilst one set of tongs is being projected forwards, the other set is drawing home. The active ends of each set of tongs are attached by joints to cross-bars, which are supported in their movements to and forth on wheels. The anchors are affixed to the cross-bars by knuckle joints, so that when the tongs are extending, the joints relax and the anchors trail upon the ground, but when the tongs contract they open and set at a suitable angle for holding. The screw shafts are actuated by bevel gearing, which is reversible by means of clutches. 2. Relates to a mode of turning the apparatus by blocking one wheel; and (3) to a sort of digging machine or implement for turning the land.

[Printed, 8*d*. Drawing.]

A.D. 1860, May 31.—N° 1338.

FLETCHER, Lavington Evans. — (*Provisional protection only.*) — This invention relates to the construction of vertical steam boilers and the use of centrifugal pumps for promoting an artificial circulation of water, the use of an artificial blast, placing rods or tubes within the fire tubes to form annular passages for the fire draught, superheating steam and afterwards tempering it by a limited admission of saturated steam or water, and constructing surface condensers with a series of groups of tubes bent to the form of a horse-shoe. In the arrangement of engines for driving screw propellers, placing the surface condenser above the crank shaft and fixing an annular cylinder on each side of the condenser, the connecting rods acting upon one crank at relative angles of 90°. Driving the air and other pumps by the other ends of the piston rods which work through the bottoms of the cylinders. "In applying a surface condenser to screw engines "already built of the inverted cylinder or over-head engine class, "I place the surface condenser above the hot well, and fix the "air pump on one side of the condenser, and the cold bath water "pump on the other side of the condenser. I drive the air pump

" and cold bath water pump by the same levers that are at present " commonly used in this class of engine for driving the ordinary " air pumps. I leave the ordinary air pumps, hot well, and injec- " tion condenser intact." The inventor refers to the Specification of a Patent granted to him March 18th, 1858, N° 550.

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 2.—N° 1358.

AUSTIN, James.—(*Provisional protection only.*)—This invention relates to traction engines for drawing ploughs and other agricultural machines. An upright cylindrical boiler constructed of steel or homogeneous metal plates is internally stayed between the crown of the boiler and the upper part of the furnace by vertical rods arranged three or four inches apart. There is a water space round the furnace and a tubular chimney opening through the shell of the boiler from the furnace through which the fuel is thrown on the fire. The products of combustion ascend to a circular flue formed outside the boiler in which there is an arrangement of heating tubes enclosed within a metal case. Helical springs support the weight above the bearings of the main axle, which slide between guides attached to angle-iron framing fixed to the boiler shell. A horizontal engine cylinder is fixed to the upper part of the boiler; bearing wheels, which with the parts connected are made to steer the engine, run loose on the ends of the main axle; a pin screwed into the nave of a horizontal fly wheel forms the crank; the end of this pin carries an arm in which a pin near the main centre works the valve rod; the under side of the rim of the horizontal fly wheel gives motion by friction to a vertical shaft on which a worm actuates a worm wheel on the main axle, and communicates motion thereto. The bearing wheels are driven by arms fixed to the axle. The peripheries of the bearing wheels are furnished with springs or prongs to enter and hold on the ground.

[Printed, 4d. No Drawings.]

A.D. 1860, June 4.—N° 1366.

PASCAL, Jean Baptiste.—(*Provisional protection only.*)—Obtaining motive power. Relates to arranging a generator which alternately produces and *condenses* steam, and " to an engine for " *receiving its motive-power.*" Cold water is suspended in the

interstices of wire cloth, and by means of a blast is blown therefrom in fine particles on to other sheets of wire cloth, which by suitable means are heated to a high temperature; the fine particles of water are thus vapourized, and "the steam thus generated "expands under the piston of the steam engine, & when it has "performed its functions it returns into the generator, where it "becomes condensed by cooling in the same capillary chambers "from which it had formerly been ejected in the form of water." The metal cloth may be heated by contact with heated surfaces or by regenerated steam.

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 5.—N° 1373.

SENIOR, CHARLES.—This invention for "utilising the waste "heat in the flues of steam and other engines" consists in inserting in each side wall of the flue, between the boiler and the chimney, a brick or plate of iron perforated with a number of holes to receive the opposite ends of tubes which are placed therein across the flue. At the back of the brick or plate a chamber is formed on one side of the flue; the other ends of the tubes are open to the atmosphere outside the plate. Cold air, heated therein by the hot draught, is drawn through the tubes into the side chambers by a fan, which forces it thence into pipes leading to apartments where it can be employed for heating, drying, and other purposes. The soot is cleaned or scraped from the tubes by means of a frame in which an equal number of washers, which slide loosely on the tubes, are placed, with liberty to move and accommodate themselves to any inequality or irregularity in the position of the pipes when the frame is moved from side to side of the flue.

[Printed, 6*d*. Drawing.]

A.D. 1860, June 5.—N° 1374.

FLETCHER, GEORGE.—(*A communication from Donald Skekel and Alexander Skekel.*)—"Regulating the draught in the tubes of "multitubular boilers." Consists, first, in applying an apparatus constructed with metal plates on the Venetian blind principle to the mouths of the boiler tubes; each plate covers a row of tube mouths; they are ranged horizontally one above the other, turning *on pivots at the ends* of their inner edges in a vertical series of

holes drilled equidistant in flat bars attached to each side of the tube plate, and are simultaneously raised or lowered into a position to increase or diminish the draught through the tubes, by sliding bars which act on studs fixed at the corners of the outer edge of each plate in a corresponding series of holes in the bars.

2nd. A plate perforated to correspond with the open tube mouths is made to slide in side grooves, and is adjustable by rods and levers, either to leave clear, partially cover, or entirely close the ends of the tubes.

[Printed, 8*d*. Drawing.]

A.D. 1860, June 5.—N° 1381.

APSEY, JOSEPH, and BUCKWELL, WILLIAM GEORGE.—(*Provisional protection only.*)—This invention relates to the forming of furnace bars of a continuous endless tube. In boilers under low pressure, the water from the boiler is forced to circulate through the tubes, and also the feed water to high pressure boilers is forced therethrough. "When using certain spiral coil tube " boilers or steam generators we insert, by preference, the spiral " coil with fire-bars made of one or more continuous tubes within " a cupola boiler having a multitubular funnel through the water " area from below the ash-pit to the top of the cylinder forming " the boiler, such cylinder being continued and terminating in a " funnel to form a receptacle for the steam chest; but where " there is less water space than is sufficient for passing the " necessary funnel tubes, we case the boiler by a smoke or heat " cylindrical and spherical top containing a jacket, terminating in " a large funnel, in which, when desirable, the steam chest may " be placed. We also use this form of boiler without a spiral " coil, but in that case the upper part of the cupola fire-box may " be studded with cup or cone indentations."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 6.—N° 1386.

WENHAM, FRANCIS HERBERT.—This invention relates, 1st, to steam engine cylinders arranged to work either high pressure or in combination with low pressure condensing. High pressure steam is first worked expansively in a cylinder of small diameter, which exhausts into a *superheating* series of pipes placed in the *smoke box; thence it passes into* a second cylinder of larger size,

which exhausts into a second superheater; it then passes into a third cylinder of still larger diametrical size, whence after being further expanded it is discharged into a condenser. All three pistons correspond in length of stroke and are connected to a crank shaft with three throws set at different angles. "The "superheated steam in its passage to one cylinder may be con-"veyed through a case containing a series of pipes, by which "means the steam will be heated in its transit to the following "cylinder, the induction steam of the preceding thus giving up a "portion of its surplus heat for the use of the steam going on to "the next cylinder."

2nd. The introduction at the ends of a cylinder of a small quantity of very hot steam behind the piston up to the end of its stroke, during the time the valves of such cylinder are working steam expansively, and after the main supply has been cut off.

The principles of the invention may be applied also to locomotive and agricultural engines.

[Printed, 8*d*. Drawing.]

A.D. 1860, June 7.—N° 1396.

MILLER, Thomas William.—This invention relates to steam boilers. 1. The boiler shell is a double casing forming a narrow outside water space; the interior is divided between the furnaces by double vertical partitions forming thin water spaces in communication with the outer case; attached to the side or sides of each furnace a short distance above the fire is a series of bent, curved, or straight water tubes which rise respectively through the crown of each furnace with open ends into the steam chamber considerably above the water line, their upper ends being held in position by a division plate; the flaming gases play amongst these water tubes which present a very considerable heating surface, and then rise at the end of the boiler to the uptake, which is separated from the steam chamber by a single plate, the back and end being formed by the water space of the outer casing.

2. Refers to modifications and additions to boilers for which Letters Patent were granted to this Inventor, bearing date May 3rd, 1859, N° 1106. They consist in arrangements as therein described for the purpose of passing the burning gases from one furnace to another, thereby effecting more perfect combustion. Horizontal connecting steam tubes are introduced between the

water spaces immediately over the furnace; the generating tubes are vertically placed, and the products of combustion collected at the end of the series of furnaces, and which before entering the uptake are brought into contact with the connecting steam tubes.

3. Dividing the steam chamber within the boiler into two parts which communicate with each other through a series of vertical tubes or sheet spaces, around and between which the products of combustion are made to pass on their way to the chimney.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1860, June 7.—Nº 1397.

VANGENEBERG, PIERRE.—This invention relates to a locomobile steam saw mill, which "consists in the arrangement and " combination of an ordinary locomotive steam engine for sawing " wood and other articles to any shape or size required. The " main shaft of the engine is caused to actuate direct on one side " a straight saw with a reciprocating motion, and on the other " side a circular saw is provided with a properly arranged carriage, " and all other necessary fittings as in common saw mills, all such " fittings being compactly arranged in a small bulk, and attached " to the locomotive engine; the whole being thus readily re- " moved from place to place as required. The driving wheels " may, however, be taken off when the engine is to be set at work, " in order to give it increased stability." Several modes of construction, disposition, and combination of saws are represented and described; the boiler in all cases is shown in a vertical position, but may, if required, be horizontally placed. The circular saws are driven by bands and pullies, and the reciprocating motions of the vertical saw blades by means of cranks and connecting rods.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, June 7.—Nº 1400.

HIGGINBOTHAM, EDWIN HENRY, and BEECH, AARON.—(*Provisional protection only*.)—This invention for preventing explosions of steam boilers consists in the use of a valve enclosed in a chamber placed either within or outside the boiler below the level of the water line; "the valve is connected to a lever passing " into the boiler in such a manner that the valve cannot open " until the long *end of the lever* rises, such lever being furnished " *with an adjustable weight*, which regulates the valve to a slight

"degree beyond the ordinary working pressure of the boiler. "Inside the boiler another lever is arranged turning on a fulcrum, "and upon one end a float is attached, which rises and falls with "the level of the water. When the 'water line' falls beneath the "proper level the float falls, and the opposite end of the lever "rises and lifts the lever connected to the valve, and thus opens "the valve, and allows the water . . . to pass into a pipe, which con- "ducts it to the fires in the furnace, and so prevents explosion."

[Printed, *4d*. No Drawings.]

A.D. 1860, June 8.—N° 1415. (* *)

GRIMALDI, PHILLIPE.—(*Provisional protection only*.)—"Im- "provements in steam generators."

"The boiler I use is entirely filled up with water, and is heated "to a temperature of 288° Fahrenheit, but without allowing "vaporization to take place in the boiler; the heated water passes "from the boiler (through an opening in the furnace fitted with "a regulating valve) in a continuous small stream into a number "of small tubes, which are carried from the furnace to the smoke "box through the boiler flues. In these tubes instantaneous "evaporation takes place, and the steam thus generated is con- "veyed by a pipe fitted with a safety valve direct to an engine "for use."

[Printed, *4d*. No Drawings.]

A.D. 1860, June 9.—N° 1424.

ROMAINE, ROBERT.—This invention for steam boilers and surface condensers relates, first, to the construction of boilers by surrounding and forming their ash-pits, furnaces, internal chambers, and flues by a continuous coil of pipe through which the water is made to circulate, by means of a spiral pump, from the feed pipe in the front below the bottom of the ash-pit, until it is delivered into the upper part of a vertical cylindrical water chamber at the back of the apparatus, the upper part of which forms the steam chamber above the water level. The chamber is connected with the delivery of the force pump by a pipe at its lower end which also communicates with the spiral circulating pump in front. The vertical chamber terminates in a descending tube fitted with a cock for blowing off muddy deposits. Within the chamber, around a central supplying water tube, there is a

circular group of fire tubes, up which the products of combustion, after leaving the body of the apparatus, pass into the chimney flue. Each succeeding turn in the coil is fitted in close contact with the preceding one leaving no space between, and the whole is encased by a non-heat-conducting material. According to the modifications shown the form of the apparatus is changed to suit its various applications; for marine purposes the furnaces and internal chamber are narrow and deep. A compound series of four are shown at each end of a steam generator wherein there are four vertical water chambers centrally placed so that one water chamber receives the hot draughts from two furnaces. In locomotive boilers the pipes coil horizontally, and the water and steam cylindrical chamber is placed above. Baffling plates are used to detain the burning gases within the apparatus, and separate pipes not in contact, spirally coiling round a central bend whereon the furnace is placed, form part of the invention.

2. The surface condenser is a closed chamber divided near the bottom by a horizontal tube plate; the lower division is sub-divided by a central vertical partition; each sub-division communicates with separate ends of the tubes, which rise from the tube plate in rows in the form of tall arches, one pipe arched outside another and so on, forming flat transverse sections in the chamber. To throw the steam against its surface, the end of each tube is fitted with a central tube with downward tapering end which leaves an annular passage for the steam. The engine exhausts into one of the lower divisions above the surface of the water maintained at a common level in both, communicating through holes near the bottom of the partition; the steam makes a circuit within the tubes from one division to the other, to which the air pump is attached. Pipes are provided for drawing off the heated water from the tube compartment and for injecting and distributing the cold water therein.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1860, June 11.—N° 1429.

JOHNSON, JOHN HENRY.—(*A communication from Narcisse Duvoir*), (*Provisional protection only.*)—This invention relates to a centrifugal governor, and to the disposition and mode of working the throttle valves of steam engines. The governor "*consists of a metal ring*, carried by a spindle, passing dia-

" metrically through it, and transversely through a hollow shaft, " which rotates in suitable bearings either in a horizontal, " vertical, or inclined position. Within this hollow shaft works " a rod or bar, having a sufficiently large opening made in it to " admit of a toothed segment fast on the spindle of the ring " gearing into a rack formed on the inner surface of the opening " above referred to in the internal rod or bar. A helical spring, " adjustable by means of a screw and thumb nut, is attached to " one end of the rod or bar, by which means the governor can be " made more or less sensitive. When at rest, or when the " tubular shaft, which may be driven by a band or pulley, or by " gearing, is rotating slowly, the ring lies nearly flat against the " opposite sides of the shaft, being retained in this position by " the tension of the helical spring above referred to; but as the " speed increases, the ring gradually assumes a more vertical " position until at the highest speed it attains a position at right " angles to the shaft; this movement of the ring on its transverse " axis turns more or less the toothed segment, which causes the " internal rod to slide longitudinally within the tubular shaft, " and this motion is transmitted in any convenient manner to the " throttle valve, so as to open and close the same." Reducing the loss of steam by condensation between the throttle valve and the cylinder by placing the throttle valve as close as possible to the steam chest, or inserting it *in the back* of the slide valve.

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 11.—N° 1430.

SALMON, PETER.—This invention relates,—

1st. To a self-acting arrangement for regulating the admission of air to furnaces. A cylindrical single action air pump is attached to the furnace door; the piston rod is furnished with a crosshead, to which slides perforated to coincide with a double row of openings through the furnace door are suspended; the piston draws and delivers at the bottom of the cylinder. When the door is opened, a lever which raises the piston rod is operated by coming in contact with a spiral incline round the hinge-pin; when the furnace door is closed, the piston rests on the air within the cylinder which is gradually forced out through a regulating cock by the pressure of the piston aided by the weight of the piston rod, crosshead and slides; when the piston is raised the

air passages through the door are fully opened, and they are gradually closed by the slides descending, the speed of the operation being controlled by the extent to which the regulating cock is opened. Air out of the ash-pit is admitted into a chamber at the furnace bridge, through a valve, by means of a lever operated by the opening of the door.

2nd. The use of furnace bars in the form of an inverted trough wherein, for the passage of air, a narrow slot extends through a considerable portion of their length.

3rd. Supplying boilers, by means of force pumps, with air saturated with steam, and heated in its passage through the feed pipes, which are coiled or otherwise, within the uptake in the boiler, smoke chamber, fire box, or flues; the steam is thus superheated, and being mixed with the air prevents the intense heat from damaging the pipes. "Only a sufficient quantity of "water is forced into the boiler to protect it from injury from the "fires, flues, or tubes through a plate or plates, pipe or pipes, "perforated with small holes, which water is also heated in the "manner above described."

[Printed, 10*d*. Drawing.]

A.D. 1860, June 12.—N° 1435.

CLARKE, JOHN.—This invention of a "registering apparatus "applicable to guages for steam, water, vacuum, heat, and "similar purposes" and "mode of weighting or balancing the "ordinary index finger of guages," consists of a flat circular case fixed edgeways on a short flanged pedestal; around the face there is a graduated index and a pointing finger on a central spindle, fixed upon which inside the case, each hanging at an angle of about 45° from a central line, there are two lever arms; the ends of these are furnished with catches which when moved in an upward direction take into ratchet wheels decimally divided, moving them each time one-tenth of a revolution which represents an unit; these ratchets actuate a series of small registering fingers, which move at decimal speeds representing tens, hundreds, and thousands on the face of the apparatus, indicating, in connection with corresponding decimal star wheels inside the case, which act decimally in rotation upon each other in concert with the ratchets, the changes which have taken place. The first motion is given by the steam pressure on the end of a small

piston inside the pedestal, the lower end of the piston being open to the steam; its upper end actuates a tappet upon a back spindle whereon a toothed sector which moves the balance lever arm is fixed, and also another sector which moves a pinion upon the end of the central finger spindle, giving motion thereto.

[Printed, 10*d*. Drawing.]

A.D. 1860, June 15.—N° 1457.

DOOLEY, John, and MAWSON, James.—(*Provisional protection only.*)—This invention relates to an equilibrium slide valve. The inventors say, "instead of allowing the outside of the valve " to be in contact with the steam from the boiler we connect the " facings of the valve to a box or casing forming a valve and " steam box combined. The box or valve has at one end a pipe " working through a stuffing box, which pipe by means of a fixed " pipe is in communication with the boiler. The rod for giving " motion to the valve or box is applied at either end, as desired, " and movement is given to it in the ordinary manner. At the " back of the valve or box there is a port or passage covered with " a balance plate held by lugs in such manner that it does not " move to and fro with the valve or box, but can be pressed to a " greater or less degree against the facing of the port by means " of a spring adjusted with a screw and set nuts."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 21.—N° 1506.

WALKER, Thomas.—This invention for indicating the height of water in steam boilers, consists of a float in the boiler "connected to a rod which passes upwards through a suitable guide " frame into an external chamber provided with a transparent " medium, as glass or talc, adapted to resist the pressure of steam " in the boiler. The glass I prefer to be enamelled on one side in " order that the position of the top of the rod or a finger or other " mark thereon may be the better seen through the opposite side. " The upper part of the rod is to indicate through the transparent " medium the height of the float and consequent height of water " in the boiler. When the float descends beyond a determined " point the rod acts to open a whistle, when the sound obtained " by the escape of steam indicates to the attendants. I also form " the rod adjustable in length in order to its being adapted to

"different boilers or different heights of water therein. I prefer "to use a float lighter than the water in the boiler, but when "using a heavier float I employ spring counterbalance."

[Printed, 6d. Drawing.]

A.D. 1860, June 21.—Nº 1511.

STEVENSON, HENRY BUENAVENTURA.—(*Provisional protection only.*)—Relating to a rotary apparatus applicable for propelling and various other purposes. Two wheels a suitable distance apart are arranged to revolve at the same speed on excentric centres, their planes of revolution being parallel. "These wheels carry "between them plates, boards, vanes, frames, buckets, or vessels' "sails, or other appliances or instruments, according to the object "of the apparatus, each of which such plates, appliances, or in-"struments is held to or carried by both wheels at points, which "are on each wheel equidistant from the centre of that wheel, "and at the same distance from each other in one wheel as in the "other, those of the first wheel being the same distance from the "centre of that wheel as those of the second wheel from the "centre of that second wheel. This may be conveniently ar-"ranged by holding each plate frame or other instrument or "appliance at one angle to the rim of one wheel, and at the "diagonally opposite angle to the rim of the other wheel, by "means of pins, rods, or arms fixed at the extremity of and at "right angles to radial arms of the wheels, and entering sockets "at opposite sides of the plate, and so carrying it; but the plates, "frames, or other appliances are not fixed fast on the wheels, but "so held to them, that though carried with them in their revolu-"tion, yet in all positions of the rotation they, that is, of course, "their planes or like sections, would always be parallel to the "same imaginary plane, and never in an angular direction to one "another. Thus, supposing the wheels mounted vertically, then "if their centres were one above the other, the plates would always "be vertical; and if their centres were sideways (the wheels being "mounted vertically) the plates would always be horizontal what-"ever the position of revolution." The wheels are driven when used for propulsion, traction, or elevating balloons, and are drivers when actuated by water, steam, or wind, and in most cases the details must necessarily vary, although the principle is to be maintained in all.

[Printed, 4d. No Drawings.]

A.D. 1860, June 25.—N° 1543.

ROUTLEDGE, William.—This invention of self-acting feed apparatus for steam boilers, consists in the use of a float suspended within an iron cistern by a rod which passes through a stuffing box, and a chain which passes over a wheel and to which at the opposite end a weight is attached; upon the cistern a stop valve connected with the water reservoir, and a steam valve connected with the boiler, are fixed; these valves are actuated suddenly by two lever arms fixed upon the horizontal spindle of the wheel, by means of a tumbler lever fixed upon the spindle, when the rising and falling of the float gives motion to the wheel. The cistern being full and while the water is lowering in the boiler, the tumbler lever is gradually raised to a vertical position, and having passed the centre, by falling over it opens the steam valve and admits the steam into the upper part of the cistern; when the pressure of the steam therein is equal to the steam pressure in the boiler, the back pressure valve opens, and the water by flowing into the boiler lowers the float, the tumbler lever falls back, shuts off the steam, and opens the water valve to fill the cistern for the next operation. A perforated distributor plate is fixed in the cistern underneath the valves, which separates the water into showery particles and causes a more sudden condensation of the steam when the water is admitted to the cistern, it also protects the float from any shock when the steam valve is opened. The number of feeds per day is registered by the apparatus, and the exact quantity of water fed to the boiler is thereby correctly ascertained.

[Printed, 10*d*. Drawing.]

A.D. 1860, June 26.—N° 1553.

CARTWRIGHT, Henry.— This invention, of apparatus for working steam expansively, relates to the use of flap valves placed in the induction passages of steam engine cylinders; the action of these valves is caused by the steam current; they open on a hinge against the direction of the induction current, and when in that position lie in rebates, the steam passing over them; at the moment of cutting off for expansion, the free end of the valves is raised sufficiently high, by means of small cams, for the steam current to strike underneath, which by throwing the valve up against its seat, suddenly cuts off the steam without "wire drawing it." The cams are on spindles, which work through stuffing boxes outside

the valve box; they are operated at the proper moment by levers connected to the working parts of the engine. When applied to reversing engines, both ports are fitted with the expansion flap valves, and each spindle carries two cams.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, June 27.—N° 1557.

MACNAB, William.—This invention in connection "with "marine and other steam engines" relates, 1st, to a surface condenser, and a general design for the construction of a pair of inverted cylinder surface condensing engines suitable for driving a screw propeller. The surface condenser, which is transversely fitted with groups of horizontal tubes opening into side chambers, is placed close to the side of the cylinders; on each side of the condenser there is one air pump, and one force pump for sending cold water through the condensing tubes; all the pumps have trunks, and single-act vertically by means of beams and levers connected to the piston cross-heads; the cylinders exhaust into the top of the condenser, and the water of condensation flows out to the air pump through troughs formed in the bottom. A little water is always retained above the pump bucket, which keeps it tight while the discharge takes place into the open well, from which the boiler is supplied.

2nd. Securing the tubes of surface condensers by the use of elastic washers fitted tightly on the end or ends of each tube against the tube plates, and confining them by a ferrule which has an inner rim to go against the ends of the tube, and a flange which, when screwed to the tube plates, presses against and beds the washer to its place.

[Printed, 1*s.* Drawings.]

A.D. 1860, June 28.—N° 1568.

ALLEN, Jacob, and GLASSON, Josiah.—(*Provisional protection only.*)—For superheating steam. Relates to a method of connecting metal tubes in horizontal tiers, consisting of two or more such tubes, curved to prevent the fracture of joints arising from expansion and contraction. "In the funnel or chimney of "the boiler I arrange tubes horizontally in tiers of two or more, "each tube being bent into a kind of horse-shoe form, the inner "tube being shorter than the outer ones; the ends of each of

"these tubes (which are on the same plane) are screwed into a "hollow casting formed with a flange at bottom for connecting it "with the steam pipe leading from the boiler, and the upper end "of said hollow casting is formed with a socket flange to receive "the lower end of another similar hollow casting, to which are "connected two bent tubes similar to those last described, and in "this manner I proceed to connect together the aforesaid tubes "and hollow castings in tiers, one immediately over the other, "making the joints of each steam-tight, and I support the outer "bent ends in any convenient manner; finally, I tie or connect "the whole together by a cap plate, through which passes a rod, "the lower end whereof is connected by a pin to the bottom of "the steam pipe or chest; the upper end of said rod has a screw "cut thereon, on which fits a nut, by tightening which the whole "series of tubes and hollow castings are firmly held together. I "propose to arrange the aforesaid hollow castings outside of the "funnel or chimney of the boiler, and to enclose said castings by "a casing so arranged that the heat can circulate freely through "the same from the funnel."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 29.—Nº 1575.

TAYLOR, JAMES.—This invention, relating to locomotive tractive engines, and wheel carriages or trucks to be used in connection therewith, is supplementary to a prior invention by this inventor for which Letters Patent, dated November 13, 1858, Nº 2348, were granted to him. Such engines, including the present invention, are constructed with either three or four wheels, and instead of arranging the guiding wheel or wheels in front of the driving wheels, which are of large diameter, and suitably disposed for sustaining the load, they are placed in the rear and so steer the machine. The steering gear for operating the wheels by means of suitable connections, may be conveniently placed either in front or at the back of the engine. When only a single steering wheel is employed, it is fixed on a short axle supported in a frame, with springs of india-rubber or other material interposed between the frame and the axle bearings. Instead of using two rubbing rings encircling the swivelling centre of the fore carriage, a concentric *groove is formed* in the upper side of the frame to receive fixed *concentric slides*, which contain a lubricating apparatus, and

whilst they steady the carriage also allow full liberty to the wheel. India-rubber springs are also adapted, either above or below, to the axles of the driving and guiding wheels. Trucks or carriages on three or four wheels, constructed to follow a train behind a tractive engine, are fitted with steering apparatus, which ensures their following in the track of the engine; this is effected by the use of a tail lever or tiller bar, which is connected to the leading wheels of the truck or carriage, and its free end placed between two studs projecting from either the top or bottom side of the hind axle of the preceding truck, so that each truck in a train steers that one which immediately follows. Trucks with three wheels are operated in the same manner. Instead of employing projecting spurs on the face of the driving wheels for holding the ground, hoops with indented surfaces surround their peripheries. The arrangement of the engine details are based upon the previous inventions, modified with regard to the driving and steering gear, and other minor matters. A superheating chamber surrounds the base of the chimney, through which the steam passes on its passage from the steam dome to the engine cylinder. The feed water is heated by passing the exhaust pipes through a tank, whereby the noise of the terminal blast up the chimney is moderated. In addition to the tractive powers of the engine, it can be employed for other purposes, being provided with a winding barrel for lifting weights and loads, hauling, warping, or otherwise setting rope and chain "falls" or pumping gear and other machinery in motion.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1860, June 29.—Nº 1576.

SOUTTER, James.—This invention relates to steam boilers constructed internally without rivetting, and to steam engine cylinders combined therewith. 1. The tube plates of boilers are drilled through with holes corresponding with the internal diameters of the tubes; they are then enlarged to the depth of about ½ or ⅜ths the thickness of the plates, into which the ends of the tubes must tightly fit. The longitudinal cylindrical flues and other parts are also fitted at each end into grooves made in the transverse plates, and all are forced or held together by long bolts which *reach head and nut* beyond the extreme ends of the *transverse plates*. The products of combustion pass from a

cylindrical furnace through small horizontal fire tubes, which are placed within larger tubes containing water in the annular spaces formed between them. Fire and smoke chambers are constructed at each end of the tube plates, where the products of combustion mix and pass back over the external surface of the larger tubes into the upper flues. 2. Placed above the boiler, in the flue, is a superheating apparatus, consisting of a number of tubes, through which the steam passes into a larger central tube or jacket, whence the engine cylinder, which is placed within, is supplied through valves constructed in such a manner that the steam is made to act on each side of two pistons which work opposite to each other on one rod in a valve cylinder. The valves are formed "in two parts, the end of one part sliding in the other part; ports "are provided at each end of the valves, and on the said valves "being worked by cam or otherwise, one of the ports opens, and "allows the steam which has just forced the piston down to pass "to the lower part of the cylinder, and drive it back, the steam "which has been previously driven out passing into a condenser "or otherwise, and so on."

[Printed, 1s. Drawings.]

A.D. 1860, July 2.—N° 1589.

MOULIN, Louis Frederic.—(*Provisional protection only.*)—This invention relates to water gauges for steam boilers, and consists in the use of conical shaped india-rubber rings or other elastic material round the ends of the glass tubes, so as to pack between them and the metal rings or sockets in which they are held; there is a circular recess round the thickest end of each ring to allow for expansion; the rings are securely held by conical nuts, and remain tight under steam pressure.

[Printed, 4*d.* No Drawings.]

A.D. 1860, July 2.—N° 1594.

SALMON, John Aitkin.—This invention, relating to apparatus for feeding boilers, and to furnaces, consists in forcing air into a boiler through a pipe into which steam is introduced by another pipe connected thereto. These pipes are located in the flue of the boiler, where the air is heated, and the steam superheated, and both combine before entering the steam chest; the air pipe is fitted with a back pressure valve to prevent the return of the

heated air to the pump. The steam is raised to a high pressure in the steam pipe, which is provided with two weighted valves. "The force pump for the air has an inlet valve on one side, and "a discharge valve on the opposite side at the top, and a water "valve at the bottom. This pump is either connected with the "engine or separate. The water is fed to the boiler either "through the air pipe or independently." Also the application to furnace doors of a hot air chamber governed by a valve to admit air, whence a passage discharges it into the lower part of the furnace; the chamber may be formed on the dead plate. Apertures are formed at the upper part of the fire-door, which raises the valve when it is opening; the valve is afterwards "closed "at a regulated period after firing by means of clockwork or "otherwise." Also the use of perforated fire-bricks as a substitute for furnace bars; or the back of the furnace bottom may be arranged with such fire-bricks, and the front part with furnace bars. Also, arranging semi-brick partitions or semicircular plates alternately along the boiler flue, so as to give the flame a curvilinear course. Also by means of a pipe in connection with a "blast engine," drawing hot air out of the main chimney flue, and forcing it into the furnace.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 3.—N° 1607.

BROADHURST, John Butler.—(*Provisional protection only.*) —This invention for heating feed water for steam boilers consists in causing such water to pass through a chamber or tube arranged, when flues are divided, to form the whole or a portion of the partition, or so contrived and shaped as to form the boundary of a flue which may be set in brickwork if desired.

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 9.—N° 1644. (* *)

POLLIT, Richard. — Improvements in steam boilers and furnaces.

"The casing of my improved boiler is cylindrical, with flat "or hemispherical ends; the fire-grates are placed in one, two, "or more flues, which are bent downwards into a flue which "conveys the products of combustion along the bottom to the "end of the boiler; they then enter into a double flue which "conveys them towards the firing end of the boiler, and back

"again to the other end; the products of combustion are then "taken by flues all around the boiler, and thence into the "chimney."

"In order to increase the combustion of the fuel, I connect "the upper part of the firing flue near the bridge to the atmo-"sphere, by a pipe which serves as a stay, and is furnished with "a damper or regulating valve to vary the quantity of air "admitted."

[Printed, 10*d.* Drawing.]

A.D. 1860, July 10.—N° 1657.

MENNONS, Marc Antoine François.—(*A communication from Adolph Keifler.*)—This invention consists of a steam generating apparatus with two furnaces; one, fitted with hollow fire-bars, is located in the centre of an arrangement of flatted pipes ranged above each other in tiers, between which flat intermediate flue spaces incline to the fire. The pipes open into and form side water communications between four vertical corner chambers, which are open to and form supporters for a shallow cylindrical vessel with convex ends, constituting the steam chamber above the water level therein. The whole is covered by a cylindrical dome-shaped case of sufficient size to form a narrow flue whence the chimney rises from the centre. The second furnace is attached to the back of the apparatus, it is in the form of an arch-covered box with an open bottom; it is placed within an outer shell to form surrounding water spaces in which the feed water is heated, whence it is, by a force pump, sent through the hollow bars of the central furnace, and the two side flatted tubes into the apparatus. All the green coal is fed on to the outside furnace which communicates with the central furnace by a short passage, through which it is supplied by pushing in the spent coal or burning coke from the outer fire. Air is admitted in the draught passage to the central furnace.

[Printed, 8*d.* Drawing.]

A.D. 1860, July 11.—N° 1668.

CLARK, William.—(*A communication from Charles Claude Etienne Minié.*)—(*Provisional protection only.*)—"Improvements "*in steam engines,*" which consist in making an engine cylinder, while its piston rod is reciprocating motion at each end in the

direction of its length, revolve on an axis or shaft to which it is fixed and to which it gives direct rotary motion. Small carriers with truck rollers are fixed on each end of the piston rod; these rollers work at right angles therewith in grooves formed round the face of a triangular frame or plate which forms the framing of the engine. On each side of the face of the frame there are two curves or arcs of circles, which, by uniting in the middle of the length of each side, form three points of inflection, and three salient points are formed by the union of the arcs at the angles. When the piston begins to move, the truck rollers engage with and begin to traverse the curved guides. "It will thus be under-" stood that the piston rods, which perform the part of lever " motors, work constantly at the same angle of 46 degrees, " 40 seconds, and that their lengths of leverage added together " will be the length of the cylinder plus the length of the piston " rods."

[Printed, 6*d*. Drawings.]

A.D. 1860, July 11.—Nº 1670.

DAVIES, George.—(*A communication from Messieurs Gargan & Co.*)—This invention relates to supplying water to steam boilers. The apparatus consists of a fixed vertical cylinder open at both ends, wherein a long piston actuated by mechanical means continuously works up and down; one opening towards the top of the cylinder communicates by a pipe with the boiler at the water level, and a second with the bottom of the boiler; a third opening at the opposite side of the piston communicates by a pipe with the supply cistern which is somewhat above the boiler; in the centre of the piston there is a long chamber which is opened to the supply cistern when the piston is at the top, and to the boiler through the upper and lower openings when the piston is at the bottom of its action. The central chamber having been filled with feed water, the piston descends and opens the two communications with the boiler; if the water is up to its working level there will be no outflow, but if it is below it, then the steam will enter the piston chamber at the upper opening and drive the water through the lower communication into the boiler. The cylinder and piston may be placed in a horizontal position.

One modification of the invention is shewn which consists of a revolving hollow plug in a socket, opening and closing communications with the boiler and supply cistern.

Another modification shows a hollow triangular slide within a suitably formed case, acting on the same principle.

Another modification of the principle is made self-acting by means of spherical chambers which are attached to the ends of rocking arms, set at an obtuse angle into the valve socket, the plug acting as a fulcrum pin wherein the communications with the boiler and the supply cistern are situated; when one of the spherical chambers is down on the plane of the fulcrum, the communication is opened between it and the boiler; in this position it will remain until feed water is required and an outflow takes place; the other spherical chamber being raised is receiving water from the supply cistern, the communication therewith being open and common to both spherical chambers when in that position; whilst the exhaustion of the lower chamber is going on the top chamber is being filled until its superior weight causes them to change position; this operation is kept up alternately with both.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, July 11.—N° 1674.

JACK, JAMES.—This invention relates to the arrangements and construction of surface condensers. The exhaust steam from the cylinders first passes through a feed water heater described in a Patent granted to this inventor the 14th October 1859, N° 2345. "In a suitable casing placed under the water line and supply "respectively for marine and land purposes, is stepped a vertical "shaft, on which is affixed arms, vanes, or similar mechanical "arrangements, having a screw-like shape and action when in "motion. Surrounding the above arms or vanes are a number "of vertical tubes, opening into chambers at the top and bot- "tom. The steam from the cylinders is admitted at the top, and "condensed in its passage to the lower chamber by contact with "the cold surface of the tubes; these tubes are kept cool by a "constant supply of cold water, either from pressure when placed "under the supply, or from a pump, and by the agitation or "circulation caused by the arms or vanes being put in motion "(say, by toothed or friction wheels, or other coupling to the "engine), and which serve to carry upwards and throw off or into "the boiler the heated or surface water in the condenser."

"A second modification may be arranged with the vertical shaft "hollow or surrounded by a casing, leaving an annular passage,

" which admits the steam to the inside of long arms, screws, or " vanes, and to a chamber at the bottom of the condenser, or " open to the cold water under the ship's water-line, or other- " wise."

[Printed, 1s. Drawings.]

A.D. 1860, July 11.—N° 1675.

POVAH, Samuel. — This invention relates to a combined portable steam engine, winch, and apparatus "for operating the " pumps and parts of the rigging, warping, raising the anchor, " and for other uses on board ships." The engine cylinder is bolted to the side of a vertical dome-topped boiler which is fixed to a "metal sole plate" on the end of a strong frame, which rests on suitable wheels and bearings and to which ring bolts are attached for lashings to the deck. The piston rod is either connected to the winch or to an intermediate shaft which gear together either for single or double purchase. The ropes or chains work over a series of pullies on the outside end of the winch shaft; these pullies have "vee-shaped peripheries" which are furnished with studs to prevent the chains from slipping thereon when such like operations as hoisting sails or cargo are being performed. There are the usual boiler appliances of water and steam gauges and safety valves, also a fly-wheel on the intermediate shaft and a feed pump.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 13.—N° 1696.

ALLEN, William, and ALLEN, William.—This invention, for preventing incrustation and corrosion in steam boilers, consists in the use of ammoniacal liquid obtained from tar, which may be introduced through the man-hole or safety valve, or by the pump through the feed pipes which will be beneficial thereto and prevent corrosion therein. Several coats of gas tar should be given to the interior of a new boiler before starting it, which will have the effect of staying incrustation or corrosion for a considerable time; afterwards three or four or more buckets full of the ammoniacal water may be introduced every two or three weeks, the quantity being regulated by the size of the boiler and the state of the feed water. When the liquid is applied it is advisable

to open the safety valve for a short time to allow the effluvium to escape.

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 14.—N° 1702.

MILLER, THOMAS WILLIAM.—(*Provisional protection only.*)—This invention consists in giving to metal tubes a spiral form around a longitudinal centre; such formed tubes to be used in the construction of tubular boilers, surface condensers, vaporizers, refrigerators and other similar purposes. Sometimes a small spiral tube is placed within a larger tube of corresponding spiral form. "In this case the tube plates for the inner and smaller "tubes would be of a greater distance apart than the exterior or "tubes of a larger diameter." The ends of the spiral tubes may be left lineable with the centre of the spiral, or they may be helical from end to end. The holes in the tube plates may be formed by cutters of the same form and pitch as the tubes, and ferrules of corresponding shape may be inserted. "The desired form or "character may be given to the tubes by pressure in dies, or "by drawing and pressure combined."

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 17.—N° 1726.

FLETCHER, JAMES.—Regulators for steam boilers: Consist, first, in causing a float to act on valves which regulate the water supply; as the level of the water sinks, the float which is attached to one end of a lever sinks with it and raises a link jointed to its other end; the lower end of the link is jointed to a short lever near the bottom of the boiler. The valve rod, the end of which rests upon the short lever, passes up a vertical tube which is united to the valve case. The sinking of the float raises the valve which opens at the top of the boiler and admits water down the tube.

2nd. In causing a spherical or other float to regulate the discharge of the water of condensed steam from a vessel, also to act as a vacuum valve. The top surface of the discharge pipe, which opens upwards through the bottom of the vessel, forms a seating to the float which rests on a disc of vulcanized india-rubber fixed to it by a circular clamp; the rising water lifts the float off its seating and opens the discharge pipe; a small external pipe is screwed into the discharge pipe below the float valve

seating, the other end is turned up outside. When a vacuum is formed within the cistern the valve float rises and admits air through the small tube.

3rd. Attaching to hollow floats discharge passages communicating with the atmosphere for carrying off any liquid that may have accumulated therein, the levers being made with tubular channels which communicate through their fulcrum joints with pipes open to the atmosphere.

4th. Removing loose organic deposits from the bottoms of steam boilers. Holes are made along the bottom which open into a closed channel rivetted thereto, and fitted at the end with a blow-off cock; the holes discharge into the channel separately; scum dishes are also used which discharge through pipes passing through the bottom of the boiler into the closed channel.

5th. A mechanical arrangement for cleaning boiler flues consisting of brushes and scrapers of the requisite form mounted on wheel carriages which are drawn or pushed along the flues; the brushes and scrapers are made to act effectually against the flue surfaces by means of back springs, and in some cases may have rotary or other motion given to them.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 17.—N° 1729.

SPENCER, George.—(*A communication from Joseph Marks.*) This invention of apparatus used for lubricating valves and pistons of engines and other machines worked by steam, air, gas, or vapour, consists in impregnating steam or other vapour with oil, tallow or other lubricating material, in its passage to its work in the engine cylinder, valves or otherwise. The apparatus is a hollow cylindrical case or box fixed to a convenient part of the boiler or engine; the central space in the box is divided from the end spaces by two perforated plates between which, thoroughly impregnated with lubricating material or liquid, there is a mass of suitable porous packing, such as cotton wick, worsted, sponge, or fine wire twisted together. The steam is admitted into the lower end space, and by passing through the packing mass to the upper end space it becomes impregnated with fine lubricating particles which it carries on to the valves and cylinder. The oil and lubricating material is introduced above the packing mass through a pipe which opens into the upper space of the chamber.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 18.—N° 1735.

SKEKEL, Donald.—(*Partly a communication from Alexander Skekel.*) This invention relates to pistons for steam engine cylinders and buckets for pumps, whereby the metallic packings are kept in constant contact with the interior surface of cylinders by a pressure of steam or air acting upon radiating sliding plugs within the piston case. The steam is supplied through a central tube attached to the back of the piston, from a tubular steam chamber projecting from and enclosing a stuffing box at the bottom of the cylinder through which the tube works. The piston is packed with the wedges outside instead of inside the packing segments; but whatever style of ring or wedge is used, the expanding force is generally steam, the plugs being forced out by internal pressure. Pressure may also be obtained for acting on the sliding plugs, from compressed air, gas or other fluid, or from an hydrostatic column. In constructing pump buckets, a number of plugs are applied between two concentric annular chambers; the centre chamber is open to the weight of the atmosphere, and a vacuum is set up in the outer chamber in connection with the condenser, by a pipe leading through a stuffing box into a vacuum tube, instead of a steam tube as stated with regard to the steam piston.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, July 19.—N° 1753. (* *)

TYRRELL, Timothy.—(*Provisional protection only.*)—Improvements in boiler furnances.

" I propose to lead air pipes through the fire-box and into the " fire tubes, and to supply these pipes with air, which will make " its escape by lateral holes into the streams of flame and heated " gases on their passage to the chimney. Or an air chamber " communicating with the outer atmosphere may be fixed in " the fire-box, and fitted with pipes leading into the fire tubes for " supplying heated air to the streams of flame.

" For increasing the draft of tubular boilers, an air chamber " may be fitted in the smoke box for the supply of a blastpipe " fixed in the chimney."

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 19.—N° 1755.

CLARK, William.—(*A communication from Charles Auguste Riff, and Antoine Laudenmüller.*)—(Provisional protection only.)—

This invention relates to duplex piston valves, for regulating the flow of steam and other fluids. The slide valve box is fixed beside the engine cylinder in the usual way, and within the box there is cast on to the main cylinder a small cylinder or open ended tube, of sufficient length to include both induction ports which open into it; the steam from the boiler enters this small cylinder between the ports, and the used steam exhausts through the steam box. Two pistons fitting to the small cylinder are fixed upon the valve rod which works through a stuffing box outside the steam box lineable with the small cylinder; when centrally placed they must cover both induction ports with sufficient lap. Upon this duplex piston valve there is no friction due to the pressure of steam. In the working of the ordinary slide valve the steam enters the induction ports at the ends of the valve from the steam box, and the ports exhaust towards each other under the valve; whereas in the duplex piston valve, the ports exhaust outward into the steam box, and the steam is supplied through the valve. Distributing valves for regulators are made also on the duplex piston principle.

[Printed, 6d. Drawing.]

A.D. 1860, July 21.—N° 1772.

MENNONS, Marc Antoine François.—(*A communication from Vincent Gâche, Senr.*)—Constructing and arranging marine steam engines. Loss of heat during the working of steam engines "is obviated by the circulation of steam, not only round the "cylinders and in their bottoms and covers, but also in the "pistons, and to economise as far as possible the heat of the "steam at the moment of its passage to the condenser a first "injection is made with the water of the air pump well, and the "product of this partial condensation collected in a recipient is "employed to feed the boiler. To obtain the maximum power "from a given weight of steam in working expansively without "the aid of a fly wheel two cylinders of different diameters are "employed in each engine of the present combination. By this "means the final pressure on the main piston being increased by "that exercised on the lesser one the limit at which the sum of "the pressures becomes equal to that of the resistances is much "more remote than when one cylinder only is adopted." A pair of vertical engines are represented for paddle wheel and a hori-

zontal pair for screw propulsion. Each engine comprises two cylinders, one main and one smaller superposed, with two pistons upon one piston rod; both pistons are worked by one slide valve; steam is admitted into the body of the main piston by means of a tube which works through the cylinder bottom into a case in connection with the boiler. The steam circulates in casings over the sides, covers, and bottoms of the cylinders through communicating apertures. The condenser, hot well, and air reservoir serve as framing for the pedestals of the beam. A stop valve checks the cooling of the cylinder by preventing the backward flow of the gases from the condenser. The steam after being raised in the boiler is superheated by passing through the tubes of a superheater placed in the upper flue space.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, July 24.—N° 1784.

ROBERTSON, Andrew, and RITCHIE, Alexander.—

This invention relates to the construction of steam boiler and other furnaces or fire-places, to pyrometers, and to the prevention of smoke, and is supplementary to a previous invention for which Letters Patent bearing date May 17, 1859, N° 1218, were granted to these inventors. According to that invention air is admitted from the ash-pit between the front ends of the fire-bars, which are left uncovered for the purpose; by the present invention an adjustable curved deflector is placed above the air apertures for the purpose of directing the air upon the fuel; the apertures may be formed by leaving unoccupied space between the front ends of the fire-bars and the dead plate, the extent of opening being regulated when necessary by a valve. A plate may be disposed under the front ends of the fire-bars, so that the air may be made to pass over the plate and between the bars and so become heated. The deflector may be applied to other furnaces including dwelling-house grates. Instead of depending alone upon the ordinary chimney draught, it may be desirable to force it, particularly when applied to a boiler, in a reverberatory chamber. It is proposed in same cases to make the grate surface of perforated fire-brick, sloping forwards and cross ridged to prevent the sliding of the fuel towards the deflector; a hopper is superposed above for the purpose of feeding the fire. Apertures are made in the flues through which to observe their condition, and a graduated pyro-

meter which depends for its action upon the varying degrees of length of an expanding metal rod so disposed in the flues that the heated products of combustion can play upon it; the upper end of the rod enters the bottom of a shallow vessel, and as the rod expands it presses upwards against a flexible diaphragm, above which in the vessel there is water, which rises up a glass tube, and according to the amount of expansion in the bar, the degrees of heat are indicated on a graduated scale by the extreme height of the column.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 24.—N° 1791.

NEWTON, ALFRED VINCENT.—(*A communication from David Stoddart.*)—"Improved means for relieving the slide valves of "steam engines of unnecessary pressure."

An ordinary slide valve is used, its back is worked to a true plane parallel with its face; the valve box is covered by a thin flexible metal plate secured between its top edges and the cover, which when screwed on forms a steam-tight joint all round. stationary balance plate attached to the flexible plate fills the centre of the space between it and the slide valve; its inner contact surface is recessed leaving a flat margin which is got up to a true surface to work on the back of the slide valve; the balance plate, the top of which is bevelled from a limited space round its centre, extends the whole width of the slide valve, and in the other direction covers an area equal to one-fourth of each steam port and all the space between them; in the under surface of the cover there is a large circular shallow recess and a central opening through which the atmosphere is admitted to the outer surface of the flexible plate. A rigid flat circular plate which partly fills the recess in the cover is fixed to the centre of the flexible plate by a tubular screw through the central opening in the cover; this screw passes up to a shoulder through clearing holes in the circular and flexible plates, and screws into the back of the balance plate and through to the recess on its face, to which the atmosphere is admitted through the tube in the screw; the centre of a flat spring held by means of a small adjustable screw at each end screwed into the cover, presses upon the head of the central screw and regulates sufficient pressure of the balance plate upon the slide valve to keep it on its seat. All the outer surfaces of the flexible and circular plates within the area of the circular recess in

the cover, and all the area within the recess in the under surface of the balance plate is open to the atmosphere; the under surface of the flexible plate is exposed to the upward pressure of the steam.

[Printed, 8*d*. Drawing.]

A.D. 1860, July 30.—N° 1851.

HEDLEY, Oswald Dodd. — Obtaining motive power and evaporating liquids by utilizing heat abstracted from the exhaust steam of a steam engine. The exhaust steam is conveyed into a cylindrical chamber filled with air tubes, through which the atmosphere is drawn by the double action of a piston in a cylinder which at the same time acts as a force pump; back pressure valves are arranged at the top and bottom of the cylinder to open and close with the alternate upward and downward stroke of the piston, and the air then heated, following the direction of the piston, is on its return alternately driven before it into the tubes of a cylindrical boiler, where, by the repeated strokes of the piston, it is compressed, and the heat it has obtained on its passage through the tubes in the exhaust steam cylinder is concentrated and partially imparted to the water in the boiler, the residue being compressed air at a then reduced temperature passes into a receiver, and may be used for actuating a compressed air engine of any suitable form or construction. In place of working air alone, as above described, a mixture of air and steam may be similarly employed. The piston is actuated by a steam engine, and, by preference, worked by the steam generated by the steam boiler. "By thus combining machinery, atmospheric air will be heated, "then compressed so as to occupy less space, and consequently "become of higher temperature and suitable for evaporating "water or other fluids." Loss of heat by radiation is prevented by clothing the apparatus.

[Printed, 6*d*. Drawing.]

A.D. 1860, August 8.—N° 1917.

DAVIDSON, Francis.—This invention relates to heating feed water for boilers, and "condensing the waste or 'blown off' steam" in marine engines. The feed water pipe is placed within another pipe sufficiently large to leave an annular passage between them, through which the waste steam is blown off; or the annular passage

may be the feed water channel, and the central pipe the blow-off passage. A modification, whereby the same result is effected, consists in enclosing within a casing or cylinder a coil of pipe through which the feed water is forced, the intermediate space within the case being the waste steam passage. For condensing purposes, the central pipe and annular passage formed by a surrounding pipe are used in the form of a winding spiral coil; the feed water is taken cold from the sea, entering the lower end of the central pipe; the waste steam enters the annular passage at the upper end, and is gradually condensed in its passage to the lower end, whilst the temperature of the feed water is gradually raised in its upward passage through the central pipe.

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 8.—N° 1925.

NEWTON, ALFRED VINCENT.—(*A communication from Soloman Nunes Caravalho.*)—" Improvements in the mode of and apparatus for superheating steam," and "prevent the rapid oxidation of the metal of which the apparatus has been composed, " consequent upon its exposure to a high degree of heat on its " one surface, and to the gases resulting from the decomposition " of a portion of the steam on the other surface." All the steam generated in the boiler passes, on its passage to the engine, through a cast metal retort charged with equal parts of iron turnings, shavings, or scraps, and the black protoxide of iron, mixed together; the steam is thus " distributed upon an extent of heating " surface much greater than would be afforded by the retort itself, " without the fragments of metal." "With such a temperature " of the retort as would be necessary to superheat the steam to a " desirable degree, the steam coming in contact with the iron of " the retort becomes decomposed, and is resolved into oxygen " and hydrogen gases, and the retort would be rapidly destroyed " were it not for its being charged with the substances above " mentioned," which operate as follows:—"The metallic iron " absorbs the oxygen, setting free the hydrogen, while the hydrogen at the same temperature passing over the protoxide of iron " converts it again into the metallic state. As the steam continues " to pass through the retort, the metallic iron parts with the " oxygen it had absorbed or combined with, and in its turn takes " the place of the protoxide, while the protoxide takes the place " of the metallic iron, and this compensating action continues."

"The metal of the retort is not materially affected." "In the "changes which thus take place, it is believed that a portion of "the latent heat of the steam is liberated and becomes sensible "heat."

The retort may be placed in the boiler furnace or flues where the hot draught is sufficient to superheat the steam, or it may be placed conveniently near the boiler in a separate furnace. The steam pipes for conducting the steam through the retort on its passage from the boiler to the engine, or from the retort to a receiver, must be varied to suit circumstances. The protoxide of copper, although not so effective as the protoxide of iron, may be used in the retort.

[Printed, 8*d*. Drawing.]

A.D. 1860, August 9.—N° 1927.

GRIMALDI, DOCTOR FILIPPO.—"Improvements in the instan-"taneous generation of steam" consist in the use of a revolving cylindrical generator made of wrought-iron plates or other suitable metal; the form of the ends, to which the axles are fixed, may be either flat or hemispherical. One axle is a solid spindle mounted on a bearing, with a strap pulley fixed on its extreme end; the other axle is a short tubular shaft opening into the generator, and revolves in a fixed stuffing box. The furnace may be constructed of brickwork, metal, or masonry. The generator revolves on its axis in a chambered space over the fire, which plays upward round each side and enters a flue in the centre of the arch above the ends being close to the sides of the furnace to protect the axles from the extreme heat. The steam chest is built in the flue, the hot draught passing round each side; a small flue, provided with a damper, forms a direct communication between the furnace and the chimney, for use when the hot draught is not required to pass round the generator. The arch over the generator may be formed by a metal casing, through which the feed water may be made to pass before entering the generator. An external steam pipe attached to a flange on the outer end of the stuffing box forms a communication between the generator and the steam chest, upon which the safety valve and steam gauge are fixed; the water feed and gauge pipes enter the generator through the hollow axis. The generator is made to revolve on its axis by means of a strap pulley on the solid spindle; or, if the spindle is tubular with radiating arms formed of suitably bent pipes, it may be made self-revolving

by allowing the steam to blow against the atmosphere. A fixed wire brush, acting against the internal surface at the top of the generator to remove calcareous deposits, may be fixed on a cranked frame, one end of which is bolted to the inside of the stuffing box, while the other enters and is steadied by a central hole in the solid spindle. The length of the stroke of the feed pump, which is driven by a crank arm on the extreme end of the spindle, may be varied to regulate the water feed.

[Printed, 10*d*. Drawing.]

A.D. 1860, August 10.—N° 1937. (* *)

STEVENS, Charles.—(*A communication from Jean Carrère.*)—(*Provisional protection only.*) — Improvements in boilers and furnaces.

"A vertical partition wall is erected between the four tubes "rising as high as the boiler, so as to separate the flames and "descending below the fire-box. There are two fires and two "stoke holes; a horizontal partition is arranged over the upper "boiler tubes, and the same on the lower; these latter being "divided by the vertical partition wall, it results that the flames "cannot mingle, but they are finally united before reaching "the chimney. The flame first heats the two lower boiler tubes, "and when it has arrived behind ascends vertically and returns in "front heating the upper boiler tubes, after which returning in "front it again ascends, and returns behind, heating the boiler "on all sides. The two flames are afterwards united at the centre "of the back of the boiler."

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 10.—N° 1943.

GILES, John.—Improvements in steam engines and in generators. Lightness of weight, simplicity of construction, and constant developement of power without the aid of a fly wheel, are sought by the inventor, whose engine belongs to the rotating class, producing direct rotary action. Within a "main cylinder" fixed horizontally on a suitable bed, concentric with the line of the main shaft, are three discs; one against the cover at each end, and the other in the centre, thus dividing the cylinder internally into two equal separate compartments; the discs are surrounded by metal packings, which fit steam-tight to the cylinder; the main shaft does not run through the cylinder, it enters

through stuffing boxes at each end, and terminates flush with the inner faces of the two end discs, which are keyed thereon. Strong throw pins relatively at opposite sides of the main centre in the two compartments connect the discs together, forming a crank throw in each of about one-half the internal diameter of the cylinder, and fitted between the discs, loose upon the throw pins, are barrels, which as the throw pins revolve are, by means of packings, kept in steam-tight contact with the internal cylinder surface; hollow sliding arms fitting to the width of each compartment are attached to the barrels, and work through steam-tight oscillating socket joints into the steam chest; the steam is admitted alternately in the same direction, either through the slides or through valves suitably arranged: other valves exhaust the space before the barrels, as they are driven round by the steam.

The improved boilers are constructed in two parts; the lower section forms a vertical cylindrical case, contracting internally towards the top, which is bevelled inwards; the furnace occupies the central space towards the bottom, leaving an ashpit below. The shell of the upper section is cylindrical of two diameters, united by plates at an angle corresponding with the bevelled top of the lower section, which forms its annular seating; the two sections are united by tubular screws, which open a water communication between them; within the largest part of the upper shell, there is an annular smoke chamber, which is open to the furnace, through a group of vertical fire tubes, within the lower or smaller end of the upper section of the boiler, which descends towards the fire, leaving a flue space all round, from the top of which short draught fire tubes open to the smoke chamber, wherefrom a flue carries the hot draught through the shell of the boiler to the chimney: the fire tubes taper upwards from the fire; an auxiliary draught hole opposite the furnace door when opened carries the hot draught direct to the chimney, through the side of the lower section if required; the working water level is above the annular smoke chamber; a long central bolt stays the upper section in addition to smaller stays.

[Printed, 10*d*. Drawing.]

A.D. 1860, August 13.—Nº 1960.

NEWTON, ALFRED VINCENT.—(*A communication from John Haven Cheever.*)—This invention, relating to packing for pistons

and other parts of machinery, and the mode of its manufacture, consists (1) in the application of mechanical travelling pressure during the process of covering the vulcanized rubber core with convolutions of strong woven fabric, which operation has heretofore been performed by hand labour. A pressing roller is mounted in a kind of trough, the bottom of which is constantly pressed towards the roller by means of springs. The woven fabric is previously coated on both sides with india-rubber cement by an ordinary spreading apparatus; a suitable length is then laid in the trough, and one edge is lapped round the core by hand. The roller is then adjusted to press against the core and made to revolve, whereby rotary motion is communicated to the core, which then at each succeeding revolution receives an additional continuous lap of the fabric, whilst the pressure of the roller thereon ensures perfect cohesion and the required solidity. For the production of piston packings, the fabric coated on both sides with vulcanized cement "is cut up diagonally, and piled layer upon "layer until a sufficient thickness is obtained, and the ends of "the cut pieces are brought together to make butt joints, and by "this means any required length of sheet is produced; the whole "is then to be vulcanized or submitted to the curing action of "heat under pressure. When cured, it is to be cut up into strips "of the required width for use as packing, and applied so as to "present the severed ends of the threads of the woven fabric "employed in the manufacture of the packing to the surface "against which the piston works." In order to impart smoothness to the surfaces of sheet packing preparatory to their being subjected to the curing process, they are dusted over with soapstone powder or blacklead, and sheets of vulcanized india-rubber previously cured at a high temperature are placed in contact therwith, and then rolled tightly together and placed in a stove. The sheet packing may be cured between surfaces of glass or metal.

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 14.—N° 1965.

WEHNERT, Nicholas.—(*A communication from Paul Trochon.*) —Improvements in consuming fuel and superheating steam. The invention *consists in generating* and combining coal and other

gas with atmospheric air and the burning products of combustion, for the economical production of steam. A cylindrical boiler is eccentrically fitted with a tubular furnace, extending about two-thirds of the length, and one-half the diameter of the boiler shell, leaving a thin space underneath. Within the furnace an ordinary formed gas retort, divided longitudinally by a vertical partition, rests on bracket sleepers fixed along each side, so as to bring the bottom of the retort about on a plane with the centre of the furnace; the space underneath the retort is divided by the fire-bars, which extend the whole length of the retort, and form the fire space and ash-pit; the fire first plays along the bottom of the retort, then upwards at the end, and back along the sides and crown, which is divided by a longitudinal partition, forming two separate flues. Towards the front of the boiler, each flue opens into a longitudinal generating tube, about one foot in diameter, which run respectively from the face of the boiler on each side of the furnace, and open into a semicircular chamber between the back of the furnace and the end of the boiler. The gas generated in the retort is carried in pipes to the mouths of the generating tubes, which are fitted with large circular burners on the "Argand" principle, the atmosphere supplied through "aerators" and regulating cocks, being drawn both internally and externally in contact with the flames, which mingling with the products of combustion from the retort-furnace flues, renders their inflammation complete. The steam dome is placed over the chamber, wherein a coil of superheating pipes is placed, one end of which is carried up to within a few inches of the top of the steam dome, and the other conveys the steam, after it has circulated through the coil, to its use through the end of the boiler by the draught passage, which opens into the chimney flue. The retorts are closed and fed in the usual manner, and by deflecting the inner end of the dead plate when the discharge takes place, the coke, as it is drawn, is made to fall towards the fire below. When applied to locomotives, the retort is placed in a slanting position within the furnace; it is arranged to open at the top and bottom, and is fed by a hopper, which is closed by a valve; the bottom is also closed by a similar valve, which when opened, allows the coke to fall upon the fire below; the mouths of the "aerators" are situated at the sides of *the boiler.* The superheating coil is arranged in the smoke box.

[Printed, 1s. 4d. Drawings

A.D. 1860, August 15.—N° 1980.

GREEN, Charles, and ASBURY, William.—This invention relates to machinery for manufacturing tubes for steam boilers. The tubes are first made in the ordinary way, and the invention consists in forming from end to end a spiral indent by pressure upon the surface of such tubes and in the apparatus for effecting it, which consists in mounting on an ordinary lathe bed, a sliding rest through which there is a cylindrical passage lineable with the lathe head-stock centres, and corresponding in size with the outside measurement of the tube to be operated, so that the tube will slide therethrough; a pressing roller or small round edged disc is mounted in the end of a frame which is fixed by a setting-up screw in a mortice extending horizontally through the sliding rest to the cylindrical passage. The tube is plugged and centered at both ends, and then mounted in the lathe, the pressing roller is set up so as to indent its surface, and, by the motion of the machine, form a helical groove by pressure, the pitch or angle of which can be increased or diminished by regulating the relative speeds of the revolving tube and the sliding rest.

[Printed, 10*d*. Drawing.]

A.D. 1860, August 17.—N° 1992.

WARDLE, James.—(*Provisional protection only.*)—This invention relates to steam " boilers having one or more internal flues, " at the front of which are the furnaces. The internal flues com- " municate by a down flue at the back to a double flue under the " boiler, one leading towards the front, and the other towards the " back of the boiler, there being a split between them at the " middle. The last-mentioned flue communicates with a side " flue leading to a down flue at the front of the boiler, which " communicates with another side flue separated by a damper " from the flue leading to the chimney."

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 24.—N° 2041.

BARCLAY, Andrew—(*Provisional protection only.*)—This invention relates to the construction of steam engines especially adapted to raising water *from mines and* such like purposes, and consists *in securely disposing the cylinder* on one side of the mouth of the

mine shaft on a suitable foundation. The piston rod is connected to an over-head beam between its centre and one end which overhangs the mine shaft, and to which the pump rods are connected; the other end of the beam carries the rod of the air pump which is disposed underneath, and the extreme end is jointed to a rocking shaft, which acts as a counterpoise to the opposite overhanging end. These arrangements may be modified by fixing the cylinder above the beam, which is then disposed in a cavity formed for that purpose in the foundation, its fore end, as in the first arrangement, projecting over the mouth of the shaft; the other working details being disposed in the most convenient manner. The pump rods of engines so constructed are perfectly free from obstruction; they may be easily disconnected without interference with the engine, which is entirely out of the way of the pumping gear. Other modifications are suggested.

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 25.—Nº 2050.

NEWALL, JONATHAN.—" Transferring the latent heat of steam " to water and other fluids," relating more particularly to heating feed water for boilers by exhaust steam from an engine, which is received into a chamber or vessel so constructed that its capacity for internal space can be increased or diminished by means of a telescopic or sliding joint with an annular packing, the small section being suspended within the outer section and counterbalanced; the interior of the chamber is furnished with a perforated metal plate placed under coils of wire or other metallic surfaces vertically supported by thin metal cylinders; the top of the apparatus is furnished with an air-escape valve; the exhaust steam from the engine rushes into the chamber, and heats, by contact, the coils of wire and metallic surfaces contained therein; the feed water is forced by a pump and dispersed by a rose within the chamber, amongst the heated coils, metallic surfaces, and exhaust steam. Heat is thus imparted to the water, which falls through the perforated plate into the lower part of the chamber, thence by a second pump it is forced into the boiler. Modifications and plans, wherein the mechanical details differ, are shown as practical applications of the principle of the invention.

[Printed, 8*d*. Drawing.]

A.D. 1860, August 27.—N° 2064.

BOUSFIELD, George Tomlinson.—(*A communication from E. S. Renwick.*)—This invention consists in constructing a stuffing box with a number of mortices radiating through the metal which forms the packing chamber into which sliding compressing blocks are well fitted. The ends of packing bricks, composed of hemp or other suitable fibrous material mixed with tallow or other lubricant, are moulded to fit round a segment of the shaft or rod, the chord of such segment being a divisional part of a circle corresponding with the number of mortices employed; the sides of the bricks are parallel, moulded to the sides of the mortices, and are chamfered at their inner corners to fit against each other on the divisional radial lines; the compressing blocks are forced against the packing bricks by set screws arranged to act upon them in the direction of the centre of the rod or shaft. The invention is applicable to various purposes.

[Printed, 6*d*. Drawing.]

A.D. 1860, August 27.—N° 2065.

BOUSFIELD, George Tomlinson.—(*A communication from E. S. Renwick.*)—Relates to blowing off the surface water when it is above a proper working level in steam boilers. " Consists of a " tight vessel forming a float chamber, and having a pipe that " descends in the float chamber. This pipe terminates at its " upper end in a passage through which the water is discharged; " it terminates at its lower end in a valve chest, having two " orifices, to which conical valves are fitted. The two valves are " secured to a valve stem, which ascends to a guide, and is secured " at its upper end to a " cylindrical float or vessel open at the top, which moves freely up and down in the float chamber leaving an annular space around; the downward motion of the float opens the valves which are closed by its upward movement. A passage is open to the boiler through a connecting pipe fixed at the working water level, which the water flows through into the chamber when the boiler is over supplied, and into the annular space and over its top edge into the float which, by descending, opens the valve and permits the water to flow on to the discharge passage. When the water is reduced to its proper level the steam gains admission to the trap and float, when its pressure by driving the water therefrom relieves the float of its weight, which then rises and closes

the valve. The chamber as connected with the boiler and float permits the escape of water but prevents the escape of steam.

[Printed, 6*d*. Drawing.]

A.D. 1860, August 28.—N° 2074.

SIEMENS, CHARLES WILLIAM.—" Improvements in engines to " be worked by the alternate expansion and contraction of steam " and other elastic fluids," consist of :—

1st. " Constructing regenerative engines of four working cylin- " ders closed at both ends, with intercommunications through " regenerators or respirators so arranged that the front of the first " cylinder communicates continuously with the back or heated " portion of the second, the front of the second with the back of " the third, the front of the third with the back of the fourth, and " the front of the fourth with the back or heated portion of the " first-named cylinder, and of connecting the four working pistons " of these cylinders to one rotating shaft so as to render their " motion consecutive, causing the front part of any one of the " four cylinders to act the part of charging cylinder to the back " or heated portion of the succeeding cylinder."

2nd. " Effecting the consecutive motion of four such working " pistons in attaching the same to four equidistant points of the " circumference of a disc or cross frame carrying a central radial " arm perpendicular to the plane formed by the four points of " attachment, which arm is connected to a working crank."

3rd. " Reversing regenerative engines with four working cylin- " ders " " by introducing valves into the four communicating pas- " sages, which being moved in concert reverse by one movement " the order of succession of communication between adjoining " cylinders, the supply and discharge valves of the engine being " at the same time reversed in their relative times of action."

4th. " Heating regenerative and caloric engines by the applica- " tion of jets of gas flame, which gas may be conveniently pro- " duced by the imperfect combustion of solid fuel in a separate " furnace or gas generator, and the utilizing the waste heat of the " products of combustion in heating the air to support combus- " tion."

5th. " Imparting heat to the gases which constitute the working " medium of regenerative or caloric engines by introducing " amongst them at such times when they are heated to the

"utmost extent by means of respirators or regenerators highly "heated currents of steam or air, or the heated products of com- "bustion produced by igniting a mixture of air and inflammable "gas compressed and fired before reaching the cylinder."

6th. "Combining the two methods of internal and external "heating in regenerative or caloric engines."

7th. "Firing a mixture of inflammable gases or vapours and "atmospheric air before entering the heated chamber or cylinder "of regenerative or caloric engines by passing the same through "a pipe or chamber with recesses presenting highly heated or "incandescent surfaces."

8th. "Cooling the working cylinder or working cylinders of "regenerative or caloric engines by causing a current of atmos- "pheric air to pass through the same at the completion of each "effective stroke."

9th. "Combining the heating and cooling arrangements of the "working cylinders of regenerative and caloric engines."

10th. "Generating inflammable gases for heating regenerative "or caloric engines by placing fuel in an upright receptacle, and "by introducing amongst it jets of atmospheric air from without "at a certain elevation, so as to produce a zone or intermediate "layer of highly incandescent fuel, which on being traversed by "the raw products of distillation from the fresh fuel supplied "above, as well as by steam or other vapours which may be "introduced, will convert the same into permanently elastic com- "bustible gases, such as hydrogen and carbonic oxide."

11th. "Utilizing the sensible heat of the inflammable gases "produced in the above-named apparatus by transferring the "same either to atmospheric air supporting the subsequent com- "bustion of those gases or to water, the vapours from which may "be used with advantage in the same apparatus, in order to be "also converted into inflammable gas."

The following Specifications of Patents granted to this inventor are referred to, namely, 9th October, 1852, N° 326, and 9th June, 1856, N° 1363.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1860, August 28.—N° 2077.

HIRST, Benjamin.—"*Improvements in the construction of "steam and other engines.*" Consists in mounting several oscil-

lating cylinders equidistant from each other round the centre of one crank shaft, all acting successively on one crank pin by means of a loose collar thereon to which the piston rods of the several cylinders are jointed, the centres of such joints being on the radial line of each cylinder in respect to the common centre of the crank shaft; the valves are worked by an excentric with a corresponding number of rods radiating from its strap equidistant from each other. The steam is admitted through passages in the framing to the trunnions on one side of the cylinders, which exhaust through their trunnions on the opposite side down other passages formed in the framing for the blow off. An arrangement of six cylinders is preferred.

[Printed, 1*s*. Drawings.]

A.D. 1860, September 7.—N° 2160.

TRAVIS, Joseph Siddall.—(*Letters Patent void for want of Final Specification.*)—" Consists in working traction engines by " means of two steam cylinders, the pistons of which move at a " great velocity, and communicate rotary motion to two crank " shafts, which can be worked independently of each other, or " coupled by a friction clutch box; on each crank shaft is fixed " a fly wheel and a spur pinion gearing into an intermediate " mortice wheel, the teeth of which gear into internal cog wheels, " cast or fixed to the driving wheels; these driving wheels are " loose on the axle, and their circumferences are rounded and " bevelled to suit the road on which they run." A vertical boiler supported by the main axle and framing is surrounded by a feed water heating cistern or case communicating with the supply tank; the piston rods pass through and can be cooled by the water in the cistern if, through high speed, they become heated. " The valves for the steam cylinders are opened and closed by " separate regulators, but a third regulator, capable of working " the valves of both cylinders simultaneously, is provided." When turning curves, bends or angles, the clutch boxes on the crank shafts are disconnected and the speed of the piston regulated; provision is also made for reversing the engines. There is a wire guard and a hood on the chimney to stop the escape of particles of burning fuel and reduce noise.

[*Printed, 4d. No Drawings.*]

A.D. 1860, September 11.—N° 2188.

HILL, Henry Cheetham.—(*Provisional protection only.*)—This invention consists in so constructing and fixing stays in steam boilers that they elongate while expansion is going on in the flues and tubes and become rigid when expansion has ceased. The inventor says,—"I make the stays with open tie bars, and " I place a cross piece at or near the centre of the opening of the " tie bars. When the boiler is cold the tie bars are at some " distance from the cross piece, but when the heat of the fire " expands the flues, the ends of the boiler in expanding cause the " tie bars to collapse until they touch the cross piece, after " which the stay becomes rigid. I sometimes apply springs " between the tie bars and the cross piece, or I make the tie bars " in separate pieces, one part acting on a spring, and the others " acting on a box containing the spring. The arrangement of " the tie bars acting on springs may be considerably modified."

[Printed, 4*d*. No Drawings.]

A.D. 1860, September 13.—N° 2214.

MURTON, Frederick Michael, and MILLINGTON, Jonathan.—This invention relates to combined throttle expansion valves for steam and other engines. These valves are operated by and connected to governors; they have a two-fold action, namely, throttling the steam on its passage to the cylinder, and causing it to work expansively. The valve spindle is composed of two parts, one the solid part, is placed within the other which is long and tubular and is supported at the lower end by a step; its upper end is connected to the pendulous rods to which the governor balls are fixed; the solid part of the spindle is shorter, it is connected at its upper end to two pieces, which project one from each arm at an angle from the tops of the arms beyond their joint pins, converging towards the spindle into a recess formed thereon between two fixed collars, whereby the spindle is made to move up and down in accordance with the planes on which the balls for the time being are gyrating; the lower end of this spindle is connected by a cotter to the hollow spindle, in which slots are formed, and to a double ended cup valve, which has thereby liberty along with the spindle to move up and down; the valves fit in metal bushes fixed inside a flange pipe into which the steam or fluid enters; the edge of each cup

valve is formed with open serrated inclines, and the top edge of each bush has serrations corresponding and inclining in the same direction, so that when the valves are raised by the solid spindle, caused by the descent of the governor balls, the steam passes through the apertures then more or less open, formed by the serrated inclines on the valves and bushes. The governor spindle is driven by bevel gearing in the usual way.

[Printed, 10*d*. Drawing.]

A.D. 1860, September 14.—N° 2218.

CALVERT, FRANCIS ALTON.—Steam engines, boilers and valves. This invention consists in equalizing pressure on the piston by admitting steam to the lower end of an engine cylinder through apertures placed at intervals round its circumference, and in making similar apertures near the upper end to admit and discharge air from and to the passage which communicates with the hot well or chamber; this chamber forms a support for the framing of the beam, the pedestal of the crank shaft, and the cylinder. The steam admission valve is a perforated cylindrical shell working within a case placed in the steam chest; the case and shell are so perforated that the steam passage can be opened and closed by only turning the shell three-sixteenths of an inch. The exhaust valve is a perforated plate fitted inside at the bottom of the cylinder, upon which, by means of a tappet connected by rods to the crosshead, it is made to slide; the bottom of the cylinder is perforated to correspond with the holes in the sliding plate, and the passage to the hot well is opened or closed as the holes are brought into coincidence with the holes in the bottom of the cylinder or not. When the piston is near the end of its strokes it closes the apertures round the lower end which admit the steam under the piston and those round the upper end which exhaust the air above it, and during the finish of its strokes it compresses the air or steam in the ends of the cylinder whereby cushions are formed to assist its return.

The improved boiler is vertical, constructed with a central dome shaped furnace; in the water space between the furnace and the outer shell there is a narrow concentric flue; the furnace door opens a fire feed passage in the shell through the concentric flue to the furnace; the products of combustion return through the fire feed passage into the concentric flue, then divide and *course* round the boiler to an exit passage at the back. The

feeding apparatus consists of a covered cistern which communicates with the boiler by pipes at different levels; in these pipes there are valves, one opening to the steam above the water line, and the other to the water; the vertical rod of a float operates a lever which acts simultaneously on the valves in the two pipes, and opens a passage for water into the boiler, which flows out of the cistern, when the pressure of steam, which by the opening of the upper valve is admitted from the boiler to the upper part of the cistern, becomes balanced; the valves being closed a partial vacuum is formed in the cistern as it gradually cools, which raises water from the hot-well through a pipe connection between them. An ash-pit damper is operated by a cylindrical sliding valve, and a whistle gives signals when the water is too low in the boiler.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, September 14.—N° 2225.

PETRIE, James.—Increasing heating surface within the flues of steam boilers. Segmental partitions are fixed at certain distances, covering openings along the flues; these partitions are formed of circular or oval metal plates bent over through the centre, so as to leave an interior space through which when fixed the water in the boiler freely circulates; they are flanged round and rivetted inside the flue, the segmental chord being placed either perpendicular or at an angle with the plane of the centre of the flue in order to prevent any lodgment of material deposits; the angular position of the chord of each segmental partition is varied so as to give a circuitous course to the products of combustion.

[Printed, 6*d.* Drawing.]

A.D. 1860, September 15.—N° 2237.

DAVIES, David, and ALLEN, James.—To prevent explosions of steam boilers by admitting steam to the fire when the boiler is too heavily pressed, or when the surface of the water has sunk below its safe working level. A duplex safety valve is attached to the top shell of the boiler directly over the furnace; the larger or top valve opens to the atmosphere, and the lower valve through the lower end of a pipe, curved to meet the effects of expansion, communicates with the fire through the crown of the furnace; the top end of the pipe is attached to the lower valve, which when

raised by the upper valve opens a passage for a rush of steam, out of the steam space, upon the fire. Holes near the lower end of the pipe are stopped by fusible plugs which melt when not protected by the water. In both cases the effect is the same, viz., to damp the fire or extinguish it by the escape of steam into the furnace.

[Printed, 6*d*. Drawing.]

A.D. 1860, September 15.—Nº 2248.

BARNETT, THOMAS.—"Improvements in high pressure steam "engines." Two cylinders of different diameters give motion at suitable angles to one crank shaft; the smaller cylinder receives steam from the boiler at its maximum pressure, whence after operating the piston to the end of its strokes, it is exhausted into the larger or auxiliary cylinder, which may also be partially supplied with steam direct from the boiler. Auxiliary cylinders being thus worked wholly or in part by the exhaust steam from non-condensing steam engines.

[Printed, 6*d*. Drawing.]

A.D. 1860, September 19.—Nº 2280.

SAUTTER, MAURICE.—(*A communication from Joseph Gill.*)—"Improvements in generating and applying steam as a motive "power." A duplex boiler is employed; one compartment, which is always full of water, may be a coil of pipe or a tubular chamber in which no vapour is allowed to form; a portion of the water is intermittently injected into the second compartment, which constitutes a vapourizing chamber in which the pressure is always below "what is due to the temperature of the injected water, con-"sequently part of this water is instantly converted into steam, "whilst the temperature of the rest of the water falls to the point "corresponding to the pressure in the vapourizing chamber," which is furnished with a safety valve and has in the upper part a mass of pebbles or other substances placed to intercept the fine watery particles in suspension. This process prevents the formation of solid deposit. Superheating steam on its passage from a high-pressure to a low-pressure cylinder, in a steam case placed between them, containing syphon tubes and capable of holding sufficient steam to supply the low-pressure cylinder, so that the pistons in the two cylinders need not have conjunctive action; the steam

in the main boiler, or from a small auxiliary boiler, circulates through the tubes of the superheater, and the exhaust steam in blowing through the intermediate spaces is superheated on its way to the low-pressure cylinder.

Obtaining dry working steam by first generating steam "considerably above the working pressure, and wire-drawing it into "a steam space into which the superheated steam at the pressure "in the boiler is injected," "the general principle being to mix "the superheated steam with the moist steam in the act of "tumultuous expansion."

[Printed, 8*d*. Drawing.]

A.D. 1860, September 20.—N° 2285.

WILLIAMSON, Alexander William, and PERKINS, Loftus.—"Improvements in surface condensers." Consist in the use of "a close air-tight box which receives the steam to be "condensed, and in which a vacuum or partial vacuum may be "maintained by an air-pump, if required. Through the top of "this box we insert a number of tubes closed at one end, their "open ends being fixed in the top of the box. A shallow box is "constructed on the top of the aforesaid box, so as to form a "chamber communicating with the interior of the tubes, through "the top of this chamber a series of smaller tubes, open at "both ends, are inserted. These small tubes descend within the "large tubes, and terminate near the closed ends of the large "tubes; a second shallow chamber is constructed above the first, "and communicating with the small tubes. A current of water "is introduced into the upper chamber, and allowed to escape "from the lower chamber, or *vice versâ*. The water is thus compelled to traverse the whole length of the small tubes and the "annular spaces between the small tubes and the large tubes. "The large tubes are thus kept cool, and their outer surfaces "condense the steam." The following reference is made, "As "provisional protection for such a construction of condenser has "already been granted to me, Alexander William Williamson, "bearing date 8th January 1859, N° 65," the inventors now claim "the construction of surface condensers in which water is "made to circulate through a series of tubes or pipes enclosed in "an air-tight box or cylinder, and arranged in the manner as "herein-before described, the water either first passing in through

"the inner tubes and out through the annular spaces between "the inner tubes and the outer ones, or *vice versâ*."

Printed, 8*d*. Drawing.

A.D. 1860, September 21.—N° 2308. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from Kenyon Cox and Theodore Cox.*)—"Improvements in rotary engines and "rotary pumps."

This invention "consists principally in constructing the sliding "piston of two parts, and applying the same in connection with "arc-formed revolving guide plates, which are secured to the ends "of the piston, and arranged between the heads of the inner "drum and outer cylinder. The edges of the pistons are packed "with soft metal, and the pistons are arranged and constructed "in such a manner as to present themselves with their outer "faces concentric to the inner periphery of the outer cylinder and "in proper contact with the periphery throughout the whole of "their revolution, and the escape of steam, water, or other fluid ". . . is very effectually prevented without any necessity for "stuffing boxes around the shaft.

"The invention also consists in a peculiar construction of the "ports in the outer cylinder, whereby, after the pistons in their "revolution have passed that portion of the inner periphery of "the outer cylinder with which the rotating drum comes in con-"tact, the steam, water, or other fluid is received into the cylinders, "both in front and behind them, until they arrive at a position "where the steam or other fluid in the case of an engine used as "a motor, may act upon them, or the water, in the case of a pump, "may be acted upon by them with a good effect, and a free educ-"tion is provided for. This is effected by constructing the ports "in the form of elongated narrow cavities, commencing near the "packing and extending to a line drawn diametrically through "the axis of the drum.

"It further consists in the construction of an adjustable packing "piece, which is fitted to the inner periphery of the outer cylinder "to constitute a bearing for the outer periphery of the rotating "drum. . . . The packing piece is adjusted to its work by means "of set screws, and it is supported laterally by blocks, whose upper "edges are bevelled off, so as to prevent the rotating drum and "pistons from striking against them as they move round."

[Printed, 8*d*. Drawing.]

A.D. 1860, September 22.—N° 2316.

TUCK, Joseph Henry.—This invention relates to improvements in air pumps, and in mechanism for working them. The air pump consists of an external cylinder into which below the cylinder piston a valve admits the atmosphere during the upward stroke, and closes whilst the piston descends. The cylinder piston is attached to the lower end of an inner cylinder, the upper end of which is clasped by a cross-head, whereby it is moved up and down by the machinery. The upper end of a vertical tube, communicating with an air chamber above, is fixed to the framework lineally above the centre of the inner cylinder. The tube extends downwards into the inner cylinder and carries at its lower end a fixed piston. Through the centre of each piston there is an air passage governed respectively by valves opening upwards. The valve in the fixed piston is attached to a vertical rod, which passes up the tube and through a stuffing box mounted on the air chamber, where it is pressed upon by a weighted lever. During the upward stroke of the cylinder piston, the air is drawn into the main cylinder through the admission valve below, whilst the air contained in the inner cylinder is compressed during its upward stroke, until the weight on the rod, which is attached to the valve in the fixed piston, is overcome and opens, allowing the air compressed in the inner cylinder to escape up the tube into the receiver above. At the commencement of the downward stroke, this valve and the lower admission valve close, and the cylinder piston valve opens to fill the inner cylinder with the air contained in the main cylinder below. Water is admitted to and above the valves and pistons, which are suitably furnished with leather packings for the purpose of being air tight. The inner cylinder works through a stuffing box formed with cupped leathers, to which water is introduced. Preference is given to a high pressure expanding steam engine, with a corresponding length of stroke for actuating the reciprocating movements of the inner cylinder, and the strokes respectively of the engine and pump are so timed in relation to each other that the engine shall be giving off its greatest power at the moment the greatest resistance occurs in the action of the pump.

[Printed, 1s. Drawing.]

A.D. 1860, September 22.—N° 2317.

BUDDEN, JOHN LEGGETT.—(*A communication from Woodford Pilkington.*)—This invention consists in obtaining motive power by the application of steam, highly rarefied gas, or other aeriform fluid, for propelling and other purposes. A screw propeller, by preference double threaded (on the Archimedean principle) is mounted upon a hollow shaft, in the usual position in the dead wood of the vessel. A cavity is formed in the boss of the propeller, wherefrom, issuing at the periphery, are formed a number of curved radiating passages, arranged according to the constructive principle of the turbine wheel. There are two distinct sets of radiating passages, which curve in opposite directions for the double purpose respectively of going ahead and backing astern. A high-pressure boiler is disposed in the after hold of the ship. A steam pipe leads from the stop valve case on the top of the boiler, down to the end of the propeller shaft, through the hollow of which it communicates with the cavity in the boss of the propeller, opening a passage thereto from the steam space of the boiler. Within the cavity there is a piston valve, which by means of a rod attached thereto is caused to slide when getting under weigh, and uncover either one or other set of passages according to the order for going ahead or astern. The other end of the rod is passed through the shaft into the vessel, where by means of suitable connections it is operated by the attendant. The propeller is driven round by the action of the steam upon the water, and the reaction of the water upon the steam, which of course must be instantaneous before condensation weakens the force of the steam. The invention is stated to be applicable as a motive power to general purposes.

[Printed, 10*d*. Drawing.]

A.D. 1860, September 26.—N° 2341.

MACNAB, WILLIAM.—This invention relates to steam engines and boilers. A set of marine engines designed for screw propulsion are shown; they comprise a pair of direct acting inverted low-pressure cylinders, and in the space between them a small pair of high-pressure cylinders, the piston rods of which are connected to one crosshead, which acts upon the central throw of the crank shaft, whilst the low-pressure cylinders which are disposed

over the line of the crank shaft act upon the two outer throws, the three throws being set at an angle of 120° in relation to each other. One piston valve works the two high-pressure cylinders, but the low-pressure cylinders have separate valves. The high-pressure cylinders and piston valve are enclosed within, and exhaust into a casing which forms a reservoir for the steam supplied to the low-pressure cylinders, to which the casing is bolted. The cylinders may be arranged to work horizontally. With regard to condensing steam preference is given to the modes described in the Specifications of two patents granted to this inventor, and bearing date respectively April 21, 1860, No. 1001, and June 27, 1860, No. 1557. The boiler is of the vertical class, surrounded by a water space. The form of the furnace is annular, the centre being occupied by a double cylindrical casing, forming a circular water space round the centre, which is open to the flues. The outer shell of the central water space spreads or expands over the fire so as to bring the burning gases in contact with the inner surface of the surrounding water space; the draught passing upwards then takes an inward direction towards the centre through a number of vertical water tubes disposed in a circle, and connecting the central water space with the upper part of the boiler, the fire draught passing out of the crown of the boiler through a number of vertical fire tubes, which superheat the steam in the steam chamber above the water level. Four external pipes form an additional communication between the upper and lower parts of the boiler, and help to keep up a perfect circulation of the water.

[Printed, 1*s*. Drawings.]

A.D. 1860, September 28.—Nº 2351. (* *)

MARTIN, William Arena, and PURDIE, James.—" This
" improvement consists in a method of giving motion to the fire-
" bars of marine and other steam-boiler furnaces for the purpose
" of clearing them from ashes and clinkers. For this purpose
" the fire-bars are supported at or near their centres in such a
" manner as to be capable of rising and falling when acted upon
" by suitable cams or levers. Beneath the front end of the bars
" a horizontal shaft carries a series of moveable cams, which
" project alternately backward and forward. From each of these
" cams a connecting rod or link passes up to the under side of

"the fire-bar above it. On giving a rocking motion to the cams "by means of a lever handle, the ends of each of the fire-bars "rises and falls alternately." "Revolving cranks may also be "used instead of vibrating cams, if preferred." "When it is "not required to give motion to the fire-bars, the cam shaft is "secured by a detent."

Printed, 6*d*. Drawing.]

A.D. 1860, September 29.—N° 2361. (* *)

DELESALLE, ALPHONSE. — (*Provisional protection only.*)— Improvements in steam-engine boilers.

"I propose to conduct the water as fast as it is produced by "condensation directly from the cylinder to the boiler, and for "this purpose I place at the bottom of the cylinder a metal pipe "or tube which unites it to the boiler, the top of which must "be lower than the bottom of the cylinder, in order that the "water may by its own weight run through the tube to the "boiler."

[Printed, 6*d*. Drawing.]

A.D 1860, October 3.—N° 2392.

WILLIAMSON, ALEXANDER WILLIAM, and PERKINS, LOFTUS.—"Improvements in steam engines," designed to work steam expansively in a series of inverted cylinders of increasing diametral capacity, but corresponding in length of stroke, and connected to throws at different angles on one crank shaft. High-pressure steam at about 500 lbs. on the square inch is admitted to two small inverted single acting high-pressure cylinders of equal capacity, which alternately operate on the ends of a beam lever; one end of this lever is connected to the first throw of a quadrupled throw crank shaft; the cylinder over this end of the lever is the first of the series. The other end of the lever works the valve rods of the air and cold water pumps. The steam valves are conical, working in boxes which form top covers to the cylinders; their exhaust steam alternately blows off through pipes into a superheater, whence it returns by another pipe to the second cylinder in the series, which, like the third and fourth, are double acting, and are fitted with ordinary valve boxes. The piston rod of the second cylinder of the series is connected to the second throw of the crank shaft, the exhaust from this cylinder

blows through a steam pipe into a second superheater, whence it returns to operate in the third cylinder of the series, the piston rod of which is connected to the third throw of the crank shaft; its exhaust steam blows through a pipe into a third superheater, whence it returns to operate in the fourth and last cylinder, the piston rod of which is connected to the fourth throw of the crank shaft; the exhaust steam from this cylinder blows into a surface condenser, constructed on the principle described in the Specification of a patent granted to these inventors dated the 21st September 1860, No. 2285. The air pump draws the condensed water out of the condenser, and the cold water pump circulates cold water therein. The steam valves of all the cylinders are timed to act in successive rotation on three centres, there being 120° of circumferential distance between the throw of the two high-pressure cylinders and the throws of the second and third cylinders of the series. The fourth crank corresponds with the angle of the third. The boiler feed water is heated by forcing it through a coil of pipes in the flues.

[Printed, 1s. Drawing.]

A.D. 1860, October 3.—Nº 2393.

RIDDELL, Joseph Hadley.—Improvements in boilers for heating purposes by the circulation of hot water, and for generating steam. The hot water boiler is constructed of either cast or wrought iron in the form of a cylindrical case. The central chamber is the furnace; it is vertically placed on a solid base of fire-bricks or other material through which an opening regulated by a cover admits air to the furnace to support combustion. An external case surrounds and forms an external flue. The fire is fed through a central door in the flue case over the furnace; partitions and midfeathers are so placed in the flue that the heat shall be effectually distributed and circulated before entering the chimney flue. The fire maintains a circulation of hot water through the boiler and the system of heating pipes in connection therewith.

The steam generating boiler consists of a similar vertical cylindrical case of wrought iron with central furnace placed on a fire-brick base with opening to admit air to support combustion as above described. Supported by short connecting pipes fixed round the top end of the cylindrical case is a flattened spherical

steam chamber of corresponding diameter with the flue case, which is bolted thereto. The water level is through the centre of the top chamber. The products of combustion rise from the furnace against the bottom of the steam chamber, then radiate through the supporting connection tubes, and passing down the outer flue, by means of distributing partitions are made to course over every part of the boiler surface before entering the chimney flue.

[Printed, *6d.* Drawing.]

A.D. 1860, October 4.—N° 2400.

WHICHER, CHARLES.—(*A communication from Messrs. Grande, Olivieri, and Mongiardino.*)—(*Provisional protection only.*)—" An " improved machine for applying steam in a manner to cause " direct rotation."

" In a circular machine or box is placed a solid iron bar in the " form of a semicircle, occupying half the circumference of the " box ; the object of this bar is to force the steam which issues " from the top of the box to bear continually on one side only. " This machine or box also contains a concentric wheel fixed " immoveably to an axle, being fitted with two pairs of articulated " valves diametrically opposite to each other, and which occu- " pying successively the space in which the steam circulates " are forced by the current to give a rotary motion to the " axle."

[Printed, *4d.* No Drawings.]

A.D. 1860, October 5.—N° 2411.

MACNAUGHT, WILLIAM.—Relates to "improvements in steam " engines."

1. Applying to condensing engines one or more auxiliary cylinders, which actuate a counter shaft connected by gearing with the main shaft. Steam from the boiler or main steam pipe supplies the auxiliary cylinders, which are fitted with expansion valves ; they exhaust into the condenser of the main engine, and are capable of working at a high pressure expansively and of condensing at a great speed in consequence of not having an a r pump.

2. Applying to the gearing or shafting, which receives motion from a condensing engine or engines, one or more auxiliary

cylinders, which exhaust into the condenser of the main engine, and are supplied with steam from the boiler or main steam pipe.

3. Applying a cylinder or cylinders to the "Woolfe" engine, either direct to the crank shaft or to it through gearing, and exhausting into the condenser of the said engine.

4. "Applying to beam engines an air pump, or air pump and "condenser, to the opposite end of the beam to that to which "the ordinary condensing cylinder and air pump are placed, "and also in applying two air pumps to one engine (of any "description), so that the one is performing the down stroke "while the other is making the up stroke."

5. Applying levers and links to transmit the motion of excentrics to slide valves so as to alter the traverse of such valves without altering their lead. The lever vibrates on a fixed centre at one end. A curved link is formed at the other end, in which there is an adjustable slide to which the excentric rod is jointed. The valve rod is jointed to the back of the link. A screw at the fixed end of the lever is attached to a rod which reaches to a slot in the link. It is stated that this screw "may "be regulated by hand or" (as shown in the drawings) "by the "governor." Reference is made to the Specification of a Patent granted to William MacNaught and this inventor, dated 8th October 1857.

6. "The application of an auxiliary cylinder or cylinders to "the form of engine patented by myself and William McNaught, "of Rochdale, and dated twenty-second January, one thousand "eight hundred and fifty-eight, which cylinder is outside the "engine house, and may be either on the single or compound "principle."

7. "A novel head gear applied to equilibrium throttle valves, "consisting of a bell crank with a slot in one arm and a "bowl on the other, the slotted arm being connected to the "governor, and the bowl acting on a lever connected to the "valve."

8. "A lubricator (solely as applied to steam engines) consist-"ing of three flat plates held down upon each other by screws "and a spring, the middle plate being caused to reciprocate, so "that orifices made in the same will be alternately filled and "emptied."

[Printed, 1s. 4d. Drawings.]

A.D. 1860, October 5.—N° 2415.

RICKETT, THOMAS.—(*Provisional protection only.*)—"Loco-"motive engines for common roads" and their boilers, which are short cylinders with flat ends; they have a flue box at one end and a smoke box at the other. An internal circular flue contains the fire, around and above which a series of tubes convey the heated gases to the smoke box. The main axle, crank shaft, and other gearing are below the boiler, and a water tank underneath them. The crank shaft actuates the main axle through spur gearing adjustable to different speeds. To avoid noise and the appearance of escaping steam, the exhaust steam is made to enter a series of chambers formed of thin sheets of metal, where natural air currents, or those raised by the action of a fan, condense the steam, and the water thus produced is again forced into the boiler.

"Where an unusual amount of tractive power is required, I "form or place outside each main engine wheel a chain pulley, "and on each of the main pair of waggon wheels forming the "train I place other chain pulleys proportionate in size to the "respective diameters of the wheels, an endless chain passes "round the engine chain pulley and the first waggon chain "pulley, and another from the first waggon chain pulley to the "second waggon chain pulley, and so on on both sides, so that "each side of the train of waggons is coupled with the engine, "and the adhesion of the whole train is obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1860, October 6.—N° 2422.

WESTHEAD, EDWARD.—(*Provisional protection only.*)—"Im-provements in generating steam, and in apparatus connected "therewith" "consists in forcing heated air into the water of "steam boilers. This air may be heated by separate apparatus, "but I propose to adapt a series of coiled or otherwise disposed "pipes to the furnace of the boiler. A current of air is forced by "the engine or other power through these heated pipes, and from "thence into the water in the boiler."

[Printed, 4*d*. No Drawings.]

A.D. 1860, October 6.—N° 2425. (* *)

YATES, WILLIAM.—"Improvements in steam boiler and other "*furnaces*."

"I place above the mouth of the furnace a hopper with a "bottom, attached to a transverse shaft, and which may be "moved by hand or otherwise, so as to open a free passage for "fuel down into the furnace. I also connect several of the "central fire-bars of the furnace together by transverse bearers "or frames supporting the outer ends of them (or those nearest "the front of the furnace) upon a rocking quadrant, which "is furnished with a lever, and the inner ends upon a roller. "There is a pin attached to the quadrant, and a slot is formed "in the front bearer or frame for imparting motion to the "quadrant, or any other suitable means may be adopted."

[Printed, 6*d*. Drawing.]

A.D. 1860, October 9.—N° 2445.

EDGE, JONATHAN.—"Improvements in steam engines." "The "first part of my invention is chiefly applicable to 'direct-action "'compound steam engines,' and it consists in an improved "arrangement of the valves and passages by which the steam "is conveyed to the high-pressure cylinder, from the high to the "low pressure cylinder, and from thence to the condenser; the "valves are wedge-shaped, and are connected together so as to "act simultaneously; the passages in the valves are so con-"structed that the steam passes direct through the valve from "the high-pressure to the low-pressure cylinder at the same time "as the steam from the low-pressure cylinder passes through the "valve to the condenser. The steam is admitted to the high-"pressure cylinder through passages in the valves, the opening of "which passages is varied by means of expansion valves actuated "by hand, or by the action of the governor on a plate furnished "with shoulders, the said plate being drawn to and fro according "to the load on the engine, and thereby giving more or less open-"ing to the passages in the valves."

The valve-box is placed between the high and low pressure cylinders; the valves are connected together and moved by one rod; the expansion valve is carried to and fro upon the back of the slide valves, its traverse is regulated by contact set nuts on the end of its rod which passes through a stuffing box outside. The ports in the slide valve have one or more divisions when used in combination with expansion valves.

"Another part of my invension consists in an improved revers-"ing motion applicable to marine and locomotive engines; the

"eccentric for working the valves is loose on the shaft, and to it "is fixed a bevel wheel gearing in a pinion loose on a stud fixed "to the shaft; this pinion gears in a wheel which is also loose on "the shaft; this wheel is connected to a friction apparatus by "which it is turned partly round when required, so as to change "the position of the eccentric, and thereby to reverse the motion "of the engine."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, October 10.—N° 2460.

RAMSBOTTOM, John.—"An improved mode of lubricating "the pistons and valves of steam engines and other machines "actuated by steam." "Consists in employing a vessel with a "narrow neck or orifice opening into or connected with the "steam chest or cylinder, or both; this vessel is filled with oil or "other lubricating material. When the engine is at work the "action of the steam displaces a little of the oil or other lubri-"cating material from the orifice of the vessel, and the condensed "steam or water takes the place of the lubricating material thus "displaced; the water being of a greater specific gravity than the "lubricating material, descends in the vessel and displaces a "corresponding quantity of the lubricating material, which is "thus raised to the orifice and carried off as before by the action "of the steam; this action continues as long as the engine is at "work, or until all the lubricating material has been displaced by "the water. The vessel is consequently always filled with lubri-"cating material or water, or both."

As applied in various positions several modifications are shown, in all of them the neck or tube is vertical, opening above or at the top of the vessel; a pointed plug partly closes the open end of the neck or tube, from or into which the lubricant overflows as it is displaced by the water of condensed steam.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 11.—N° 2478.

BARKER, William.—Regulating the speed of steam engines by a combination of parts in communication with the governor which acts through them upon the admission, slide, and expansion valves. The tubular slide on the governor spindle is lengthened and a circular rack is formed thereon, it gears into a seg-

ment in which are fixed studs carrying two pawl catches which actuate a wheel fixed to a lever arm; "these catches move the "lever in contrary directions, and to the lower end of the lever is "connected a rod which gives a to-and-fro motion to a spiral "cam" loose on a shaft driven at the same speed as the governor by mitre gearing from the governor spindle; the tappet carries the cam round, and both act on a bowl which is connected to the rod of the equilibrium valve, or it may be connected to the slide or expansion valves of a steam engine which are "kept open for a "greater or less portion of the piston's stroke, according to the "relative positions of the cam and tappet. The details above "given must be varied according to the peculiar construction or "arrangement of the engine to which the improvements are "applied."

[Printed 10d. Drawing.]

A.D. 1860, October 11.—N° 2480.

ROUSSEAU, Louis Henri.—"Relates to an improved steam "engine in which steam regenerated is acting upon the piston "conjointly with saturated steam, without thereby sensibly occa-"sioning any counter pressure in the cylinder." The saturated steam from the boiler passes into a steam-box in which there works a cut-off valve; it next passes into a second valve-box in which the valve openings remain unclosed to permit the free ingress and egress of the "saturated overheated vapours;" after the steam has done its work in the cylinder, it exhausts into a rotating distributor which is divided in three compartments, and by making two revolutions while the piston makes six strokes, opens passages to the regenerating tubes, which run through the boiler furnace and flues exposed to the fire; the steam regenerated returns to another compartment of the distributor and thence through a valve to the steam-box to re-act upon the piston conjointly with the saturated steam from the boiler. The superabundant steam after passing round the cylinder blows through a feed water heating apparatus and thence to the atmosphere.

[Printed, 8d. Drawings.]

A.D. 1860, October 13.—N° 2494.

RESTON, *Samuel*. — *(Provisional protection only.)* — Rotary *engine*. *A cylindrical shell is* fixed on a central shaft by means

of a spiral partition, one edge of which is attached to the shaft and the other edge to the shell, whereby a spiral passage is formed through the apparatus. Two or more spiral partitions are sometimes fixed within the cylinder, which then form distinct spiral passages of a coarser pitch. The shaft and apparatus are made to rotate with great velocity by the admission of steam at one end of the cylinder, which, after passing through the spiral passages, may be made to enter a second cylinder, and so on until its force is completely exhausted.

[Printed, 4*d*. No Drawings.]

A.D. 1860, October 13.—N° 2499.

RUSSELL, John James, and BROWN, Burdett Lambton —This invention relates to a steam regulator by means of which steam generated at a higher pressure than it is used, is, while passing through the apparatus from the boiler to the engine, regularly reduced and supplied thereto at the constant lower pressure required. Two or more steam pipes and apparatus may be connected to the same boiler, to reduce and regulate the pressure of steam supplied through them to two or more cylinders working distinct under separate pressures. Upon one end of the rod of an equilibrium valve there is a small piston, which works in a cylinder attached to the valve box; a helical spring, held in the end of the cylinder by a cap which is pressed inwards by the end of a weighted lever, has a constant tendency, by pressing the piston against the valve rod, to lift the valves and thereby open the steam passage from the boiler into the valve box. The steam therein acts upon the face of the piston against the resistance of the spring and lever, which being regulated by a screw, determines the amount of resistance required to regulate the action of the piston on the valve against the super-pressure in the boiler.

[Printed, 8*d*. Drawing.]

A.D. 1860, October 15.—N° 2502.

GRIMSHAW, Weston.—(*Provisional protection only.*)—This invention of "apparatus for superheating steam in locomotive " steam engines," "consists in conveying the steam pipe from the " boiler of a locomotive engine into the smoke box, and thence " *partly up the chimney*, within which it is coiled previous to " *descending to* the steam chest; by this means the steam is

"superheated before it enters the steam chest and cylinders of "the engine."

[Printed, 4d. No Drawings.]

A.D. 1860, October 15.—N° 2506.

ROBERTS, SAMUEL.—(*Provisional protection only.*)—The object of this invention is to construct steam engines which generate their own steam and so dispense with the use of the ordinary boilers. The inventor says:—"I propose surrounding the cylinder "with tubular flues and heat chambers, the fire being placed on "a hearth in the ash-pit beneath, and supplied with air from a "blast, or an ordinary furnace may be employed. Water is sup-"plied to a casing around each of the tubular flues by a feed "pipe and pump, said pipe passing through the fire box and into "the heat chambers; the water then passes through the valve by "a pipe, and returns through the fire box into the cylinder, by "which time it will have attained such a degree of heat as imme-"diately previous to or on its entrance to the cylinder to flash "into steam." For maintaining the required heat and "increas-"ing the generating power of the steam," perforated plates, gauze sheets, rods, or pins for the water or steam from the valve to fall upon are placed at each end of the cylinder, which is made longer than the traverse of the piston.

[Printed, 4d. No Drawings.]

A.D. 1860, October 16.—N° 2518. (* *)

ROBERTS, RICHARD, and SYMONDS, THOMAS EDWARD.—(*Provisional protection only.*)—"Improvements in marine steam "engines, and in machinery and apparatus connected therewith." A surface condenser with tubes arranged so that access may be had to them by removing a gland or joint. The apparatus is placed below the level of the water so as to have a current of cold water through it, and it is so inclined that the cold water enters at the lower end and the hot water from the condensed steam flows to the lower end, so as to be conveniently removed. Deflectors cause the cold water to impinge on the various tubes. Boilers are fed by a pump worked by a lever, which is adjustable in its stroke without stopping the pump. This is effected by a sliding bearing, so that the position of the fulcrum, and therefore the stroke of the lever, may be regulated. Twin screws are to be used for propelling vessels, *one under each* quarter.

[*Printed, 4d. No Drawings.*]

A.D. 1860, October 17.—N° 2524.

RAMSELL, William.—This invention relates to boiler plates, which by pressure between grooved metal rollers, or by hydraulic, steam, or other pressure between metal dies or moulds, are made to receive indentations or corrugations all over their surface, excepting a margin all round, which is left flat for the purpose of rivetting such plates together. By this process boiler plates are not only rendered more capable of bearing pressure without much tay support, but possess increased heating surface.

[Printed, 10d. Drawing.]

A.D. 1860, October 18.—N° 2541.

HABEL, Edward, HOLZWASSER, Jonas, and BURNS, Edward.—"Improvements in steam engines." "Consists in "the employment of a cylindrical condenser furnished with an "internal piston, upon which the atmospheric air is allowed to "operate, and in introducing steam to such condenser by suitable "valves at intervals for the purpose of maintaining a vacuum "therein, instead of the ordinary air pump. The steam admitted "is to be of sufficient volume and pressure to expel the air ad-"mitted, to move the piston and the water of condensation, and "to fill the condenser, after which this steam is condensed by "injection of water, and a partial vacuum formed in the con-"denser, which is then ready for the admission of air to act upon "the piston, such operation being conducted alternately above "and beneath the piston at each stroke of the piston of the main "steam cylinder, the object of the invention being to dispense "with the air pump employed in condensing engines, and to "employ instead of the usual condensing chamber a condensing "cylinder, in which condensing cylinder a piston ascends and "descends similar to the piston in the steam cylinder, the piston "rod of such condensing cylinder being connected to the main "driving shaft of the engine to which it is attached."

[Printed, 10d. Drawing.]

A.D. 1860, October 19.—N° 2553.

JACK, James, and ROLLO, David.—This invention relates to the construction of surface condensers and feed water heaters, and also to the arrangement of parts of steam engines in relation

thereto. 1. Increasing the capacity of ordinary tubular surface condensers, by adding thereto additional casing containing thin narrow transverse chambers formed by metal plates; these chambers alternately form distinct channels for the condensing water and the exhaust steam. 2. Constructing surface condensers with metal plates so as to form thin narrow transverse channels, through which separately flow the condensing water and exhaust steam. 3. The use of an extra tube plate in connection with tapered tubes and tapered packing for fastening the ends of tubes in their respective plates.

Various arrangements and construction of feed water heaters supplementary to James Jack's Patent of the 19th October, 1859, N° 2345.—Placing a feed water heater on an auxiliary boiler or between it and a surface condenser, such auxiliary boiler blowing its steam through the surface condenser for the purpose of obtaining fresh feed water.—Placing a regulating valve between the condensing water and feed pumps and the surface condenser and feed water heater, and also between the condensing water pump and the supply.

Combining and arranging surface condensers and feed water heaters with the parts of marine steam engines named in the aforesaid Patent, and in one of subsequent date granted to James Jack, July 11th, 1860, N° 1674, and with the parts of other engines.—Placing the feed water heater between the condensing cylinders on the top of the surface condenser when applied to compound high and low pressure direct-acting vertical engines, the surface condenser being placed between the connecting rods, and working the pumps in a line parallel to the piston rod.

Placing the feed water heaters at the sides or back of the cylinders, and the surface condenser under the cylinders, and working the pumps in a direct line with the piston rod, when applied to two ordinary direct-acting engines.

Placing the feed water heater and surface condenser alongside the cylinders of horizontal engines compounded to work high and low pressure steam. Drawing or forcing cold water through surface condensers by the air pumps.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1860, October 19.—N° 2558.

BURCH, Joseph.—This invention relates to vertical steam boilers.

A.D. 1860, October 17.—N° 2524.

RAMSELL, William.—This invention relates to boiler plates, which by pressure between grooved metal rollers, or by hydraulic, steam, or other pressure between metal dies or moulds, are made to receive indentations or corrugations all over their surface, excepting a margin all round, which is left flat for the purpose of rivetting such plates together. By this process boiler plates are not only rendered more capable of bearing pressure without much stay support, but possess increased heating surface.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 18.—N° 2541.

HABEL, Edward, HOLZWASSER, Jonas, and BURNS, Edward.—"Improvements in steam engines." "Consists in "the employment of a cylindrical condenser furnished with an "internal piston, upon which the atmospheric air is allowed to "operate, and in introducing steam to such condenser by suitable "valves at intervals for the purpose of maintaining a vacuum "therein, instead of the ordinary air pump. The steam admitted "is to be of sufficient volume and pressure to expel the air ad-"mitted, to move the piston and the water of condensation, and "to fill the condenser, after which this steam is condensed by "injection of water, and a partial vacuum formed in the con-"denser, which is then ready for the admission of air to act upon "the piston, such operation being conducted alternately above "and beneath the piston at each stroke of the piston of the main "steam cylinder, the object of the invention being to dispense "with the air pump employed in condensing engines, and to "employ instead of the usual condensing chamber a condensing "cylinder, in which condensing cylinder a piston ascends and "descends similar to the piston in the steam cylinder, the piston "rod of such condensing cylinder being connected to the main "driving shaft of the engine to which it is attached."

[Printed, 10*d*. Drawing.]

A.D. 1860, October 19.—N° 2553.

JACK, James, and ROLLO, David.—This invention relates to *the construction of* surface condensers and feed water heaters, and *also to the arrangement* of parts of steam engines in relation

thereto. 1. Increasing the capacity of ordinary tubular surface condensers, by adding thereto additional casing containing thin narrow transverse chambers formed by metal plates; these chambers alternately form distinct channels for the condensing water and the exhaust steam. 2. Constructing surface condensers with metal plates so as to form thin narrow transverse channels, through which separately flow the condensing water and exhaust steam. 3. The use of an extra tube plate in connection with tapered tubes and tapered packing for fastening the ends of tubes in their respective plates.

Various arrangements and construction of feed water heaters supplementary to James Jack's Patent of the 19th October, 1859, N° 2345.—Placing a feed water heater on an auxiliary boiler or between it and a surface condenser, such auxiliary boiler blowing its steam through the surface condenser for the purpose of obtaining fresh feed water.—Placing a regulating valve between the condensing water and feed pumps and the surface condenser and feed water heater, and also between the condensing water pump and the supply.

Combining and arranging surface condensers and feed water heaters with the parts of marine steam engines named in the aforesaid Patent, and in one of subsequent date granted to James Jack, July 11th, 1860, N° 1674, and with the parts of other engines.—Placing the feed water heater between the condensing cylinders on the top of the surface condenser when applied to compound high and low pressure direct-acting vertical engines, the surface condenser being placed between the connecting rods, and working the pumps in a line parallel to the piston rod.

Placing the feed water heaters at the sides or back of the cylinders, and the surface condenser under the cylinders, and working the pumps in a direct line with the piston rod, when applied to two ordinary direct-acting engines.

Placing the feed water heater and surface condenser alongside the cylinders of horizontal engines compounded to work high and low pressure steam. Drawing or forcing cold water through surface condensers by the air pumps.

[Printed, 2s. 10d. Drawings.]

A.D. 1860, October 19.—N° 2558.

BURCH, *Joseph*.—*This invention* relates to vertical steam *boilers*.

1. To the construction of boilers with a central furnace, out of which, by a passage at the back, the hot draught passes into narrow concentric annular flues which divide the water space between the furnace and the boiler shell; an exit passage for the hot draught is made to connect the annular flue to the shell of the boiler; beneath the fire bars there is an ash chamber enclosed by a water space below. The top and bottom of this description of boiler have a hemispherical form.

2. Consists of a similar construction of boiler described above, but without the ash chamber and water space below, the fire bars being open underneath.

3. Consists in the use of a series of annular heating pipes arranged above each other in the water space between the central furnace and the outside shell, in place of the annular flue before mentioned.

4. Consists in combining or piling central furnaces and annular flues or heating pipes above each other within one cylindrical shell, a water space being left between each furnace, wherefrom separate passages conduct the hot draught through the boiler shell to the chimney.

[Printed, 1s. Drawings.]

A.D. 1860, October 22.—N° 2575.

GEDGE, WILLIAM EDWARD.—(*A communication from Charles Delcourt, Pierre Boulicault, and Claude Maupoil.*)—Feeding steam boilers with water heated by exhaust steam.

Two covered reservoirs or chambers are placed conveniently contiguous to the engine; the smaller one receives cold water from the well by means of an ordinary force pump; the larger one receives exhaust steam from the engine cylinder through the exhaust pipe which opens into it just below the level of the cover; a water pipe attached to and communicating with the lowest level in the cold water chamber distributes, by means of a rose, a constant spray of cold water upon the spent steam on its passage through the exhaust pipe, to which it is united about midway between the hot water chamber and the engine; the exhaust steam which excapes condensation, the condensing water, and the water condensed thereby, flow into the hot water chamber, out of which the boiler is supplied by the feed pump, and the residuum steam escapes to the atmosphere through a discharge pipe in the

cover. A valve cock upon the valve box between the suction and force pipes removes any established counter pressure and reprimes the hot water feed pump; extra pipes and stop valves are provided to effect a double circulation of the water; at such times the cold water feed pipe must be closed. Water gauges are attached to each chamber to indicate the height of their respective contents, and means to open them for cleansing purposes are provided.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 24.—N° 2595.

EDDINGTON, William, jun.—This invention relates to the constructive arrangements of steam engines to be used to operate draining, ploughing, and other agricultural implements. The carriage frame, within which the winding drums are mounted on vertical axes, is supported by the axles of the driving wheels. One side of each drum is furnished with annular gearing, which when required is set in motion by pinions vertically disposed between the drums, and actuated by bevel gearing upon a vertical shaft. The boiler is mounted over the frame above the drums and gearing, and the engine is superposed upon the boiler, the smoke box end of which rests upon a vertical screw, whereby the level of the boiler may be maintained whilst ascending or descending inclines. The piston works to and forth towards the fire-box, the connecting rod being coupled to the crank shaft, which is transversely disposed on suitable bearings attached to the boiler. The crank shaft carries a fly wheel and a spur wheel which gears into a companion wheel upon a transverse counter-shaft beneath the boiler. From this shaft the power is distributed by suitable gearing. The driving wheels are loosely mounted on the main axle; each wheel is furnished with annular gearing driven by pinions, on separate short shafts which lineally revolve on the same plane, each being supported in suitable bearings fixed to the frame. The free ends of the short shafts carry fixed spur wheels, which are actuated by pinions loosely mounted upon a counter shaft. By means of two hand levers these pinions are respectively set in motion by two clutches, which slide upon the shaft and are made to revolve therewith by fixed keys sunk along its surface. The driving wheels may be actuated together or separately, and the drums, *which are for the purpose* of hauling the cultivating implements *by means of ropes*, are operated in the same manner. The

steering apparatus, which acts upon the fore guiding wheels, is of the ordinary description; these wheels are arranged to lock in either direction.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 26.—N° 2617.

PALMER, William.—This invention, relating to a mode of packing the pistons of cylinders, consists in enclosing the periphery of the piston or bucket with an endless leather band, whereon surrounding this band is a band of vulcanized india-rubber covered by another band of leather securely stitched to the first, so that the india-rubber band which gives the required elasticity to the packing is enclosed and protected on both sides by the leather, which comes immediately in contact with the cylinder. In some cases, especially where the piston works in an iron cylinder, the outer covering of leather is circumvested by an endless band of brass wire gauze, whereby the durability of the packing is considerably increased, as the principal part of the friction is borne by the metallic gauze. The packing is secured by a conical ring, which is forced on to the lower edge of the first leather band. Other modes are devised for securing the inner band of leather to the piston or bucket.

[Printed, 8*d*. Drawing.]

A.D. 1860, October 26.—N° 2618.

SYRETT, William.—Improvements in steam engines: Relate, 1st, in reference to beam engines, "the placing of the non-con-"densing cylinder on the outside of the condensing cylinder, so "as to give the piston of the former cylinder a longer stroke and "a greater velocity than has the piston of the latter cylinder, and "enable the steam used in the said non-condensing cylinder to "exhaust into the condensing cylinder, and be used expansively "therein."

2nd. "The application to portable engines of a high-pressure "and an expansive cylinder either with an equal or an unequal "length of stroke, so as to use the steam from the high-pressure "cylinder again expansively."

3rd. In reference to "double-cylinder engines, whether hori-"zontal or vertical, and of equal or unequal strokes, the placing "of the respective cylinders in such a manner that a connect-

"ing rod can work between them, and also the use of a non-"condensing cylinder with a longer stroke than the condensing "cylinder."

[Printed, 10*d*. Drawing.]

A.D. 1860, October 27.—N° 2625.

MABON, Walter, junior, and GAULTON, William Peel.—This invention for heating feed water for steam boilers by exhaust steam from high pressure engines, consists in the construction of a long rectangular flat case with flange and cover, in which from end to end a coil of copper or other metal pipe is closely packed, the coils of such pipe being laid down against each other; the ends of the coil pass through the side of the case, one is connected with the feed pump and the other with the boiler feed pipe. The ends of the case are formed like flatted funnels with flanges around their mouths, by which one end is connected to the exhaust pipe of the engine and the other to the chimney blast. There is a constant current of cold water entering one end of the coil, and this becoming heated on its passage through, passes out at the opposite end in nearly a boiling state, the exhaust steam being blown through the case at every discharge of the cylinder.

[Printed, 6*d*. Drawing.]

A.D. 1860, October 30.—N° 2656.

JOHNSON, John Henry.—(*A communication from Edward Scheutz.*)—This invention of a rotary steam engine relates to the use of a cylinder slightly conical, and an interior rotating piston shaft made to a corresponding form, in order that as the surfaces wear by friction the proper contact between the piston flanges and the cylinder may be kept up by means of a screw which acts on the end of the piston shaft. Within the cylinder there are two steam stops diametrically disposed, which divide the annular steam space between the cylinder and the central piston shaft, which is in frictional contact with the centres of the stops; these stops curve gradually at each side to the arc of the cylinder; in opposite sides of the piston shaft there are deep longitudinal mortices in which moving diaphrams extending between the piston flanges radially slide; these slides are forced outwards by helical springs, and inwards against the springs by the curved ends of

the stops, through which the induction and eduction ports open to the cylinder. A circular disc steam valve communicating by separate pipes with the induction ports, changes the direction of the piston when the engine is reversed, the corresponding exhaust ports being then simultaneously closed.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 30.—N° 2657.

HENDERSON, JAMES McLINTOCK.—This invention of "Im-"provements in marine steam engines" relates to the construction and arrangement of framing for oscillating cylinders with direct diagonal action either for paddle wheels or screws. The sole plate of such engines is planned to suit the space between the cylinders, it forms the condenser and principal bases of the engines; the trunnion bearings for the cylinders are cast thereon, and to it the upper framing is attached. The air pump, which is worked by an excentric, is to be disposed in any position to suit the other arrangements.

The wheels for paddle engines are made with double rings to protect the feathering floats which are of iron; the cranks are placed on the face of the floats, and, in connection with the excentric rods, draw the floats into nearly a vertical position when entering the water; the excentric is placed abaft the centre of the paddle wheel.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1860, October 31.—N° 2663.

PEARCE, JOHN CHARLES.—(*Provisional protection only.*)—This invention for steam engines and boilers, relates to making the outer ring of metallic pistons "in two parts depthwise," and the inner spring ring with wedge shaped surfaces, so as to maintain a constant lateral and vertical pressure upon the outer rings, and thereby keep them in contact with the cylinder and the piston flanges; also fixing the piston upon the rod, by means of keys drawn into key grooves formed in the eye of the piston and the conical part of the rod.

Making an engine throttle valve in two parts, a seating plate and a valve plate, fitted accurately face to face; the seating plate is fixed in the chamber passage; the valve plate is attached to a spindle, which gives it circular motion on the face of the seating

plate, by means of a lever; both are perforated with holes to correspond, these holes in one position of the valve all coincide and form the only thoroughfare for the steam, which by means of a slight rotary movement of the valve plate actuated by the lever, can be either partially or entirely cut off.

Fixing cylindrical vessels to the sides of fire and smoke flues, " by rivetted seams running longitudinally, or by metal rings or " frames rivetted between their respective surfaces so as to admit " of ample passages for the circulation of the water into and out " of the vessels."

" Constructing the furnace grate bars with two longitudinal " parts connected together by a series of light cross ribs."

Fitting safety plugs, composed of fusible metal, into cast-metal sockets, by which they are fixed to the boiler plates.

[Printed, 4d. No Drawings.]

A.D. 1860, November 1.—N° 2668. (* *)

JOY, David.—" Improvements in the valves of steam hammers, " which are also applicable to other purposes."

" My invention consists, first, in moving the valves of steam " hammers, steam pumps, and hydraulic engines . . . by the " direct action of the fluid or steam or gas actuating the hammer, " pump, or engine; this is done by allowing the piston, when " near the end of the stroke either way, to pass over and uncover " a port or hole in the side of the cylinder, allowing the steam or " fluid from the cylinder to pass direct on to the end of this " valve, which is a cylinder moving in a cylinder, or is attached " to a piston moving in a cylinder, and thus push it over to the " reverse position, the opposite action then takes place at the " opposite end of the cylinder.

" By the second part of my invention I . . . . . regulate the " length of stroke, whether for hammer, engine, pump, or meter, " by having the ports for letting steam or fluid at various places " up the side of the cylinder, and opening that one which gives " the right stroke by a cock or valve; or I use only one port for " each end of the cylinder, and vary the stroke by increasing or " diminishing this port and so accelerating or retarding the " action of the valve by these means; the hammer may, if neces- " sary, be worked by hand only."

[Printed, 1s. Drawings.]

A.D. 1860, November 1.—N° 2676.

HARRATT, Charles. — This invention relates to "giving "motion to a shaft or axis used in propelling vessels, ploughs, "and machinery," by combining steam power intermittently with the force of manual labour, in such manner as to take effect at those points in the revolution of the shaft where the greatest resistance occurs, and the greatest effort to overcome it is required, the force of the men who sit and act together by pushing and pulling at the crank being continuous. The engine is to be disencumbered of all those parts which give continuous motion; the valves are to be worked by hand, or when required for other purposes, the auxiliary aid of the engine is to be applied only when from the position of the crank in relation to the free power of the men, it will render most efficient service, whether the vessel be propelled by oars or by paddle wheels, which are constructed and fixed at each end of the working crank shaft. Jointed to the connecting rod are two sliding beams, extending fore and aft, furnished with cross handrails, at which rows of men expend their power by alternately pushing and pulling at the rails, being assisted over the crank centres by the timely aid of the engine.

[Printed, 1s. 4d. Drawings.]

A.D. 1860, November 2.—N° 2682.

CLARK, William.—(*A communication from Pierre François Joly.*)—Steam boilers, which consist of a combination of certain parts. 1. Longitudinal generating cylinders placed over the fire in the furnace, inclining downwards towards the back of the apparatus; their raised ends form steam chambers over the front of the furnace, where the water level is established. A collecting pipe in front of the apparatus, with branches attached to each generating cylinder, communicates with, 2, the superheaters, which are separated from the generators by the deflecting roof of the furnace. They are composed of 24 tubes in two series, fitted at each end into tube plates, which are covered by protecting plates, with holes to correspond with the tubes; the ends of each tube are sealed and covered by caps; the steam from the collecting pipe is made to traverse the whole of the tubes in succession, whence it passes into, 3, a cylindrical steam chest, which (as some of the modifications show) is placed over the apparatus, or on

supporting standards behind, upon a water reservoir, which is in communication with the generators; it is furnished with safety valve, steam pipe, and water regulating apparatus, consisting of a ball float hanging through the opening which communicates with the reservoir, from a lever in communication with a double-action stop cock attached to the suction tube of the feed pump. The furnace and flue spaces of the apparatus are enclosed in a double casing filled with sand as a non-conductor, or in a brick-work enclosure, the upper surface being covered with sand. The steam chest is encased in wood. The invention is applicable to ordinary purposes, combining the parts and principle described, but varying in each in their general arrangements.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1860, November 3.—N° 2692.

ROBERTS, George.—(*Provisional protection only.*)—This invention relates to steam boilers and flues. "The casing of the " boiler is cylindrical, with hemispherical or egg-shaped ends, and " the internal flue is open at the side near one end of the casing, " and extends to near the other end, where it is turned round, " and is then carried back to the end from which it started, where " it opens to the opposite side of the casing. In horizontal " boilers the products of combustion pass under the boiler, they " then enter the internal flue through which they are conveyed, " and then pass along an outer flue which is in communication " with the chimney; the peculiar arrangement of the outer flues " may, however, be varied. When my improved boiler is placed " vertically, the internal flue opens near the lower end of the " casing, and it is turned over at a certain distance from the " upper end to allow for water and steam above the internal flue: " the blow-off cock is placed at the lowest part of the boiler." A damper is arranged by which the hot draught can be sent direct to the chimney, the internal flue being closed whenever the boiler is not operating.

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 7.—N° 2736.

HYDES, William Kitchen.—(*Provisional protection only.*)—This invention relates to steam boilers and surface condensers which are of suitable shape with a movable lid. Fastened to the outer of two tube plates are "a number of small tubes open a

"both or one end; these tubes slide into larger ones, fitted to the "inner plate, and leave an annular passage between the tubes. "The steam from the cylinders may pass down the small tubes, "be condensed, and drawn off from the annular space for feeding "the boilers; or air pumps for creating a vacuum; pumps for "forcing or drawing a continuous supply of cold water, or any of "the methods used in connection with condensation may be "used. Through the 'up take' I bring an air pipe or tube which "leads to a fan properly fixed; this fan when put in motion forces "the air forward through twyeres placed and opening into the "sides of furnaces; to marine boilers and furnaces in towns this "arrangement is specially applicable, by the readiness with which "the necessary draft can be maintained."

In constructing boilers a number of vertical water tubes open to the water space, are fixed into and descend from the furnace roof towards the fire; between these hanging tubes the heated gases and flame circulate. The plates forming the sides of the furnace and other heating surfaces in boilers, are indented to increase their heating capacity.

Forming or shaping the indented plates, "consists of placing "in a large frame a number of punches (in rows or otherwise), "and in bringing these to bear on the heated plate by hydraulic "power; the punches or stamps being opposite to indentures or "dies in the bearing plate."

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 7.—Nº 2744.

MAIDEN, Isaiah, and HALL, Edward.—(*Provisional protection only.*)—This invention relates to slide valves for steam engines. The steam is made to act against the face instead of against the back of the valve which is confined to its seat by a piston under steam pressure; a roller is used as a medium between the under side of the piston and the back of the valve which is thereby left free in its sliding motions. The aperture for the admission of steam and the space between the laps of the valve are formed with angular sides.

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 8.—Nº 2755.

GILLIES, James.—(*Provisional protection only.*)—This invention "*in valves for steam engines*" regulates the action of the

valves by the agency of the governor. The valve is worked by a horizontal revolving shaft, the free end of which is close to the vertical spindle of the regulated valve upon the steam supply pipe of the engine. The governor is connected to the operating parts by means of a bell-crank lever and shaft arrangement. An annular grooved ring, acted upon by the bell crank, is made to slide longitudinally while the shaft revolves; the shaft is tubular with a longitudinal slot, through which the sliding ring is connected to an inner solid shaft, which projects beyond the end of the tubular shaft and carries a boss formed with inclined disc faces. "At the base or starting point of each inclined face there "is a square or flat end piece of the full width or length of the "disc, and this tapers gradually down laterally or upon the face "until it dies off in the plain or simple annular portion of the oper-"ating piece. The vertical spindle is fitted with a lateral concave "piece of metal within range of the rotatory action of the inclined "disc." "When the engine goes too fast, the governor, operating "upon the bell crank," "draws the inclined disc piece more or less "away from the valve spindle, and hence the inclined face slips "off and clears itself from the valve spindle at an early period; on "the other hand, when the engine goes too slow, the governor "pushes the inclined disc forward, and the latter thus retains the "valve open for a longer period. The valve spindle is fitted with "a cross head working in guides, which cross head abuts in its "upward movement against caoutchouc rings or buffer pieces. A "screw spindle and hand wheel are also fitted on for setting the "valve as may be required."

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 14.—N° 2792.

CROSLAND, James Stead.—This invention in relation to steam engines consists in applying a pair of angular oscillating cylinders, or a pair of angular fixed cylinders with single or forked connecting rods to work upon one crank pin, coupled or connected by gearing to the crank shaft of a single or a pair of condensing engines which have other auxiliary cylinder or cylinders acting with them; the said angular placed cylinders may receive steam from the boiler or from high-pressure cylinders, or one may receive the exhaust steam from the others and exhaust into the condenser; or both the angular cylinders may exhaust into the main engine cylinder and condenser.

The application of a drag link to the crank pin of a condensing engine when coupling a high-pressure cylinder thereto, "the " length of the drag link being the difference of lead of cranks or " exhaust."

Working the air pump of oscillating engines direct from the main crank pin or from an intermediate throw formed on the main crank arm. Forming an excentric on the main crank for the purpose of working the air pump, the excentricity being with the crank pin. The application of anti-friction rollers to an excentric, for the purpose of working the air pumps of steam engines. Placing the crank shaft of an engine out of the centre line of the cylinder, to give space for the working of an air-pump rod. Constructing the working trunnions of oscillating cylinders on the slide valve chest, and casting the whole in one piece with the cylinder. Connecting the pipes of blow-off taps to the exhaust side in oscillating steam cylinders. Fixing a condense water valve or pipe into the bottom of the valve chest of an oscillating cylinder, and connecting it to the exhaust pipe or trunnion, for the purpose of blowing the condense water therethrough. Connecting a pipe, for a permanent escape from the ends of oscillating cylinders, with the exhaust side pipe or trunnion. "Connecting the " sweeps of oscillation to the valve spindles of oscillating cylin- " ders." Placing the excentric for working the slide valves of oscillating cylinders upon the boss of the main crank. Working the valves of oscillating cylinders by a lever and rocking shaft, by the use of ball and socket jointed lever ends and rods, and by other modes. Applying to oscillating steam engines a link motion with excentrics which possess different throws. Applying and connecting gear to the link motion, which is regulated by the governor. Constructing and forming the journals or ends of connecting rods and links and other journals, so that the brasses are secured by wedges acted upon by screws or springs. Securing parts of an oscillating steam engine to an engine-house wall. Constructing the framing of a pair of angular oscillating or other engines in one main girder frame, thereby securing the trunnions of the two cylinders and the bearing of the crank shaft together.

[Printed, 3s. 6d. Drawings.]

A.D. 1860, November 14.—N° 2795.

LING, Samuel.—(*Provisional protection only.*)—Apparatus for *lubricating steam* engines consists in forcing the lubricating

material into the steam pipe or valve box, which effects the lubrication of the valve and piston. An ordinary force pump is used for the purpose, "that is, with two clacks or valves, the one to "shut against the pressure and the other against the lubricating "material," which is carried along by the steam.

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 15.—N° 2803. (* *)

BAGSHAW, George.—"An improved arrangement of the flues "of steam boilers for consuming smoke."

"The bridge at the back of the furnace is made much longer "than usual, and is so formed that the smoke after passing over "part of it shall descend and return to a chamber underneath it, "with which chamber there are one or more air tubes communicating with the atmosphere. At the front of the bridge are "one or more apertures communicating with the chamber, which "apertures allow the heat from the furnace to pass to the chamber "and ignite and burn the smoke, the gases passing off by one or "more flues to the chimney."

[Printed, 10*d*. Drawing.]

A.D. 1860, November 16.—N° 2812. (* *)

BÉZIAT, Jean Cirille Marius. — "Improvements in the "means or apparatus employed for permitting, stopping, and "regulating the passage of steam, water, and gases."

"I employ a valve opened and closed by a 'helix (hélice) or "sort of screw action, that is to say, I form in the valve stem or "spindle a helical or spiral groove, path, slot, or channel, or path "or channel of the curve or shape of a screw thread, in which "works a pin or projecting piece on a rod, so that by turning the "rod or the spindle the opening or closing of the valve is effected "to the desired extent, and the passage of the steam, gas, or "water permitted, interrupted, or regulated."

[Printed, 8*d*. Drawing.]

A.D. 1860, November 16.—N° 2813.

WILLIAMS, Charles Wye.—This invention relates to a mode of increasing heating surface in the construction of the flues and tubes of steam boilers. A longitudinal series of short truncated cones are united by circular contracting plates; these plates have

a central opening which corresponds in size with, and is united to, the small end of a cone on one side, and the large end of a cone on the other, plate and cone in succession, thereby forming a length of furnace or flue tube, or pipe, internally into a series of conical chambers opening into each other; in some cases the tubes are indented, one side of the indentation or serration being at right angles with the centre of the tube, and the other inclined from the bottom to the top. The direction of the hot draught enters the small end of each of the conical chambers in succession, striking with full effect upon the internal face of the transverse division plates. In some cases the central openings in the division plates are eccentric with the circumference. The short radii are placed along the bottom of the flue, which then can be cleaned from the end. When the division plates are made square or oblong, the forms of the chambers must be in conformity therewith. The invention is applicable in the construction of stills, refrigerators, and for condensing purposes.

[Printed, 8*d*. Drawing.]

A.D. 1860, November 19.—N° 2840. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from Louis Brandt.*)—(*Provisional protection only.*)—"This invention consists " of improved means of and apparatus for supplying air under " pressure to the furnace or furnaces, or to the fire rooms of " steam vessels by means of the paddle wheels. To this end " a pipe or pipes is or are conducted from the wheel-houses down " to some convenient spot near the fire rooms, or to an opening " under the grates of the furnaces or near the fires, so that a " current of air may be forced down to the fire room or to the " furnaces by the motion of the paddle-wheels."

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 21.—N° 2854.

HOWDEN, JAMES. — This invention relates to various improvements in steam engines and boilers, and apparatus connected therewith.

Placing two small high-pressure cylinders against the end of a low-pressure cylinder which receives their exhaust steam; the piston rod of the latter works between the high-pressure cylinders, the pistons of which are connected by a cross piece and rod to the

slide block of the large cylinder piston, thus allowing space for the connecting rod.

Two small cylinders are placed on one end of a large cylinder which is fitted with a piston trunk, to which the small piston rods are united; the form of the trunk preferred is flat or elliptical on account of space.

The piston rods of three cylinders of different sizes actuate a beam lever to which two are connected on one side of the fulcrum and one on the other side; steam at a very high pressure first operates the smallest cylinder which exhausts into the second, and from that into the largest, the valves being suitably arranged.

Two low-pressure cylinders of equal size receive steam from a pair of small high-pressure cylinders; they are placed on the square nearly at right angles with each other; the four piston rods are attached to the limbs of a cross which transmits the power through a vertical central rod which operates downwards between the cylinders upon a crosshead.

A slide valve is relieved from pressure by fitting a valve plate on its back, nearly equal to the area of its face; this plate which is carried by the valve works against the back of the valve box, or against a surface plate fixed therein; an india-rubber packing between the valve and the valve plate keeps the latter in contact with the back surface, and excludes the steam from acting on the back of the valve.

Exhausting steam from one or more cylinders through the tubes of a surface condenser cooled externally by forcing an atmospheric current through the condensing chamber; the evaporation from water sprinkled upon the tubes mixes with the air which is afterwards directed into the boiler furnace through the ashpit, to assist combustion.

The application of hemp or other packing round the ends of the tubes of surface condensers, the tube plates being recessed to receive it.

Using a refrigerating cistern open to the cold well, for cooling the water from condensers of marine steam engines.

The use of leather or other pliant material for the division plates of refrigerators, for the purpose of making the cooling currents run in an opposite direction to the water being cooled.

Regulating the speed of steam engines, by supplying steam *in proportion to the resistance*; for this purpose metal springs (or

other elastic material or media) are placed between the prongs of a driving clutch. The compression of the media acts upon a lever in connection with the throttle valve.

In the construction of steam boilers, placing a series of vertical tubes in connection with flat hemispherical chambers on each side of the furnace; the upper chamber communicates with horizontal cylindrical vessels over the fire in which a common water level is maintained. The steam from these cylinders passes into receivers which are exposed to the hot draughts in the flues of the apparatus. Four modifications in the construction of boilers are shown, comprising combinations of horizontal cylindrical vessels in communication with each other within the flue casing in connection with steam receivers.

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1860, November 26.—N° 2895.

TRAIN, George Francis.—(*A communication from Messrs. Grice and Long.*)—This invention relates to "steam carriages, and "the running gear for street and other railways." The under frame of the carriage is constructed sufficiently long to form an open platform at each end beyond the carriage body. Upon the forward platform the boiler is placed on one side and the engine on the other, allowing space between for the engineer; the water tank is placed behind the engine and boiler, across the front of the carriage. "The engine consists of two cylinders placed at an "angle of, say, about 30°, with their piston rods working through "the lower ends thereof between guide frames, the connecting "rods being coupled to a pair of crank arms on the ends of a "transverse toothed or friction pinion shaft, which has its bearings "on the lower side of the engine frame. The toothed pinion or "small friction wheel on the transverse shaft gears into a large "toothed or friction-grooved wheel staked on to the axle of the "driving wheels. In some cases I prefer to use an endless "chain band in place of the cog or friction gear described." Instead of supporting the hind part of the carriage frame on wheels in the usual way, it is mounted upon a two or four-wheeled truck, and attached thereto by a vertical centre pin, which projects through the bottom of the carriage. The truck frame is furnished with a number of anti-friction rollers set in concentric curves round the centre pin; the bottom of the carriage being furnished with

plates curved to correspond, in regard to the centre, with the anti-friction rollers, the body turns easily thereon, whenever any deviation occurs out of the direct line of locomotion. A spiral spring is attached to the fore end of the truck to prevent undue vibration when the carriage and truck are running in a direct line.

[Printed, 10*d.* Drawing.]

A.D. 1860, November 26.—N° 2896. (* *)

MOY, THOMAS.—(*Provisional protection only.*)—" Improvements " in direct-action steam engines and pumps."

Two pistons are made to work horizontally and two vertically. The former are connected together by long bolts or rods, so as to leave a space between them equal to the length of the other pair of pistons, the latter being connected together by a suitable frame or slab. The frame or means of connection of the vertically acting pistons carries brasses in which the crank pin is inserted. The pistons working horizontally are also made to act against the ends of the other two pistons and move them in a horizontal direction. " Thus a connection is formed between the two pistons " working horizontally and the two pistons working vertically " and the crank, by means of which the crank is alternately acted " upon in a vertical and horizontal direction, and its continuous " revolution effected. The engine may also be used as a force " pump by applying power to the shaft and adapting ordinary " pump valves to the engine."

[Printed, 4*d.* No Drawings.]

A.D. 1860, November 27.—N° 2912. (* *)

SMETHURST, JOSEPH.—(*Provisional protection only.*)—" Im- " provements in slide valves of steam engines, and for other " purposes where slide valves are employed."

The improved slide valve is made hollow, and the steam is admitted into its interior, whence it passes through the admission ports into the cylinder. In the face of the valve working against the seating is a recess for the escape of the exhaust steam. " The " openings through which the steam enters the valve and passes " to the admission ports are of about the same area as the work- " ing faces of the valve and the exhaust port, by which means " the *pressure of steam* may be regulated so as to give any " *required pressure to the valve* against the seating. . . . .

"The above-described improvements in valves may be applied "to water meters, and in any other case where a slide valve is "employed for steam, air, water, or other fluid or liquid."

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 28.—N° 2919.

MARDELL, David.—(*Provisional protection only.*)—This relates to steam engines and obtaining feed water for marine boilers. The connecting rods of two high-pressure cylinders actuate one crank shaft, and the connecting rod of a low-pressure cylinder works on to another crank shaft, the two shafts being so connected by gearing that the low-pressure piston makes two strokes to every single stroke of the high-pressure pistons. The three cylinders are placed close to each others. The two high-pressure cylinders exhaust near the end of the stroke through a series of holes in their sides into direct steam passages which conduct the exhaust steam to the low-pressure cylinder without passing through the ports or valves. The high-pressure pistons are worked by ordinary slide valves, and the low-pressure cylinder exhausts through the high-pressure cylinders into the condenser, or through a slide valve in the usual manner; during the latter part of the stroke of a high-pressure cylinder it exhausts into the condenser. The two exhausting series of holes in the high-pressure cylinders are so regulated by valves that during the up stroke of the high-pressure pistons the lower series of holes are closed, and the upper series during the down stroke.

Obtaining fresh feed water from sea water admitted into a closed vessel to which heat is applied; the use of a pump produces a partial vacuum in the area above the water, whence a thick vapour of fresh water rises, "which is carried away by the "pump and delivered into a vessel, wherein it condenses, being "fresh water."

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 29.—N° 2931.

DARLEY, William.—(*Provisional protection only*).—This invention relates, (1), to facilitating the turning of the fore wheels of portable steam engines. "For this purpose the axle of each of "the fore wheels is carried by a separate upright shaft, and upon "each of these upright shafts is fixed a segment of teeth taken

"into by a screw wheel, and these have simultaneous motion "given to them in the direction desired from a main axis." 2. "The improvements have for their object means for adjusting the "level of the boiler when moving or standing on uneven ground. "For this purpose the fore end of the boiler is suspended by "screw connections from the fore axle or axles in such a manner "that by turning one part of the screw connection in one "direction that end of the boiler will be raised, whilst from the "opposite direction the boiler will be lowered at that end." By preference, a spring sustained by the fore axle is used to suspend the fore end of the boiler in connection with the screw. The engine thus arranged may be employed for tractive, stationary, or agricultural purposes. The throwing in and out of gear with the main wheels, when required for the stationary working of the engine, is effected by causing the bearings of the crank axle to slide.

[Printed, 4d. No Drawings.]

A.D. 1860, December 1.—N° 2947.

JACKSON, Arthur.—Generating steam for an engine from water heated by the combustion of inflammable gas mixed with atmospheric air. A vertical cylindrical generator with hemispherical crown is placed upon a circular chamber of corresponding diameter, into which air is admitted through a series of holes extending all round the base; this chamber is covered with wire gauze, which forms a diaphragm between it and the boiler furnace. A quantity of pumice stone or other non-consumable heat-retaining material is spread all over the wire gauze. The gas is admitted through a pipe into the lower region of the chamber, where it escapes, and is distributed by suitably formed pipes; here the combination of the air and gas takes place, and the product, rising through the gauze and layer of pumice stone, is ignited above and the flame comes in contact with the heating surface of the boiler, which may be formed with heating tubes and chambers, or otherwise.

[Printed, 6d. Drawing.]

A.D. 1860, December 1.—N° 2953.

AUSTIN, James.—*Relates to steam ploughing and cultivating machinery, which may partly be* used as a traction engine. This

invention is based on a previous patented invention dated the "16th day of January 1858, No. 72." The first part relates to machinery for ploughing and cultivating, a description of which will be found in the section of Abridgments devoted to that subject. The second part relates to a locomotive or traction engine for use in connection with cultivating machines. The boiler is upright cylindrical, constructed of steel or homogeneous metal plates; stays three or four inches apart connect the dome of the boiler to the crown of the furnace, which is surrounded with water space; external pipes, through which the water in the boiler circulates, are covered with external flue casing. The engine cylinder is fitted horizontally on the top of the boiler inside the chimney. The piston connecting rod works on to a stud fixed in the arm of a fly-wheel which revolves horizontally on a fixed centre. The stud is cranked outside towards the centre, and carries the excentric for actuating the slide valve. The rim of the fly-wheel gives motion by frictional contact to a pulley fixed on the top of a vertical shaft; a worm on the lower end of this shaft actuates a worm wheel upon the main axle, which gives motion to the wheels, the worm acting as a break when descending gradients. A circular water tank is placed upon one side of the boiler, and a fuel box on the other, and the usual accommodation for the driver is provided. "The peripheries of "the driving wheels are fitted, if required, with curved springs "or prongs, which enter the ground as the machine is propelled "along, and so give it an increased hold." A modification is described in which an arrangement for lessening speed is made by fixing a strap pulley on the nave of the fly-wheel, and another on the vertical shaft; the strap, hanging loose when not required, is brought up by means of a tightening pulley actuated by a lever, which at the same time throws the friction pulley out of contact with the fly-wheel.

[Printed, 6*d*. No Drawings.]

A.D. 1860, December 3.—N° 2960.

GALLOWAY, William, and GALLOWAY, John.—Relates to the construction of longitudinal cylindrical steam boilers fitted at the end with a vertical cylindrical shell surrounded by a water space, within which the furnace and fire-bars are situated near the base; immediately over the fire there is a shallow circular

water chamber covered with a tube plate pierced to communicate by a circular group of vertical water tubes, an annular water space (which forms a central flue), and a central conical water tube, with the parts and water spaces above. The burning gases are spread by the convex bottom of the flat chamber; they pass upward all round it, and then incline outwards through the circular group of vertical tubes above, entering the central flue by four passages made through the water casing. The top of the conical tube is connected to the water space through the sides of the chimney by branch pipes. The fire-box diminishes in diameter towards the top, so that the sides may present an inclined surface to the flame. A thin water space attached to the bottom of the shallow chamber is rivetted to the sides of the furnace, which it divides, and extends below the furnace into the ash-pit. The longitudinal cylindrical shell is fitted with an internal flue, in which a double or triple series of vertical conical water tubes are rivetted, according to a former patent of these inventors dated 11th March 1851, No. 13,552.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1860, December 4.—N° 2971.

HIGGINBOTHAM, Edwin Henry, and BEECH, Aaron.—(*Provisional protection only*.)—Relates to the prevention of boiler explosions by damping the fire with water from the boiler, which is effected by means of a valve situated below the water line either within or outside the boiler; this valve is operated by a weighted lever in communication with another lever and float inside the boiler. When the water level sinks, the float depresses the end of the lever to which it is attached, and raises the other end, which actuates the external lever to which the valve is connected. When the valve is raised, the outflow of water upon the fire takes place through pipes in communication with the furnace.

[Printed, 4*d*. No Drawings.]

A.D. 1860, December 5.—N° 2988.

DUMÉRY, Constant Jouffroy.—This invention of "apparatus "for extracting from water or any liquid the bodies in dissolution "or in suspension" is based on the laws of gravitation and density, the result being effected by simply raising the temperature of the liquid sufficiently high for crystallizing, or by solidifying

the solvent matters therein, and separating them by precipitation. It consists in fixing a vertical pipe to the side of the boiler, to form an external communication at a high and low level with its liquid contents, by means of a junction branching off into the bottom of the boiler near the bottom of the pipe. The bottom of the vertical pipe is attached to and opens into a chambered receptacle which receives the extracted matter. When the liquid is heated within the boiler, a constant slow descending circulation of the liquid between the upper and lower parts of the boiler is set up in the pipe, into which the heavy matters, brought to the surface by ebullition, flow through a funnel attached to the end of the pipe within the boiler, and gradually settle into the receiving chambers below. Boilers are provided with a number of these circulation pipes placed either vertically or at an angle, but always in communication with the highest and the lowest level of the heated liquid. Instead of separate chambers, the vertical pipes, which are sometimes fitted with agitators to remove crystallization, are attached to a longitudinal receiving pipe. Water is purified on its passage from the force pump to the boiler, by apparatus constructed to act on the principle of the invention, which is applicable to many purposes.

[Printed, 2s. 2d. Drawings.]

A.D. 1860, December 8.—N° 3008.

DAVIES, George.—(*A communication from Richard Montgomery.*)—This invention relates, 1st, to the use of corrugated plates in the construction of steam boilers, the corrugations running circumferentially in the direction of the curves. The shells and flues of boilers are made with such plates; the corrugations are fitted into each other and rivetted to form the longitudiual joints; the plates for the transverse joints are formed with flat margins for the convenience of rivetting them together; these margins are bent over to a right angle in the construction of flat chambers. 2nd, relates to the construction of steam boilers combining a series of thin vertical water chambers alternately with flue spaces between. "When such a series of flues "and water spaces are to be connected with the arch or roof of "the fire-box, the rear margin of the latter is to be slit at right "angles to its edges, so as to form a series of tongues which "correspond in width with the adjacent water spaces and flues. "Those tongues, which correspond with the water spaces, are

"bent at right angles to the plan of the roof, so as to extend "downwards a short distance against the ends of the water "spaces. The other alternate tongues are not bent, but project "under the tops of the flues, which, as before stated, are formed "by the overlapping top and bottom flanges of the sides of the "water spaces. The whole is then secured by rivets and caulked "in the usual manner."

[Printed, 1s. 4d. Drawings.]

A.D. 1860, December 8.—N° 3015.

HOCKIN, BARTHOLOMEW.—(*Provisional protection only.*)—This invention relating to the construction of steam boiler and other furnaces with a view to the economical consumption of fuel, the smokeless combustion of bituminous coal, and to supplying heated feed water, consists in dividing the furnace longitudinally with a narrow hollow partition, which extends from the back of the dead plate to beyond the furnace bridge, which it divides, and may reach vertically from the bottom of the ash-pit to the crown of the furnace; into this hollow partition chamber cold water is either pumped or permitted to flow, whence by means of an injector or otherwise it is supplied in a heated state to the boiler, or to be used for other required purposes. Behind the bridge, which may be constructed of fire brick supported in an iron frame, is disposed a sliding damper, by means of which the communication between either half of the furnace with the back flues may be closed. The fuel is fed alternately to each half of the furnace through separate doors in front, the half last fed being closed by the damper at the far end, in order to bring the gases and fuliginous matters evolved from the fresh fuel while in a state of distillation, round the front of the partition and over the fire bed in the other half of the furnace then in an incandescent state, where the gases and visible matters are ignited and consumed. By the time the fuel last charged has become thoroughly coked, the incandescent fire in the other half of the furnace will require replenishing, the damper then closes the flue communicating with the newly fed fire, and by reversing the direction of the draught, brings the products of combustion over the fire which was previously closed. In this way, by alternate feeding and operating the damper, perfect combustion of the gaseous and fuliginous *products is insured.*

[Printed, 4d. No Drawings.]

A.D. 1860, December 10.—N° 3029.

HUDSON, Robert.—This invention for generating steam, is a vertical cylindrical vessel, somewhat in the form of an inverted bell with a hemispherical crown; the furnace is underneath; a tube from the boiler descends through the centre of the fire into the ash-pit below, where it is fitted with blow off and waste water cocks, and the feed water attachment. The centre of the apparatus is occupied with the steam chamber, which is contracted and open near the top of the boiler, and descends near to the bottom, leaving an annular water space round the sides. The steam pipe enters near the top of the boiler, passing by a bend down into the steam chamber; a central stay bolt extends through the extreme length from top to bottom. The boiler is flanged round a little below the water level, and rests upon the upper edge of a circular brick furnace, built sufficiently large to leave a surrounding flue, which is divided at bottom in vertical sections to make an equal distribution of the burning gases over the surface of the boiler.

[Printed, 6d. Drawing.]

A.D. 1860, December 15.—N° 3089.

PRINCE, Alexander.—(*A communication from François Joseph de Bayelt.*)—Relates to the condensation of waste steam from non-condensing engines and heating the water so produced before it re-enters the boiler. Within an upright cylindrical receiver is centrally formed a cylindrical wrought-iron condensing chamber, covered with a tube plate perforated to receive the ends of 52 tubes which hang therefrom and support within the chamber a small vessel covered with a corresponding tube plate, into which the lower ends of the tubes are fastened. The cold water descends from an upper cistern through the central tube into the small chamber, whence it rises up the surrounding tubes and flowing over the tube plate falls into the surrounding receiver, which by a pipe near the top, overflows into a reservoir below the apparatus, whence the upper water cistern is supplied by means of a pump. The water of condensation and remaining steam from the condensing chamber are forced by a double action pneumatic pump through a pipe, which discharges them deep into a regenerating cylinder, which is fitted through the end of the boiler extending 6 feet by 7 inches in diameter into the flue towards the furnace;

here the water and steam are regenerated, and the product passes into the boiler above the water level.

[Printed, 10*d*. Drawing.]

A.D. 1860, December 19.—Nº 3115.

McGAULEY, James William.—(*Provisional protection only.*)—This invention relates to apparatus for preventing collisions on railways by shutting off the steam while the engine is in motion, not by the action or direction of any person on the engine or connected with the train, but by means of an inclined plane placed between or upon the rails, so that in cases of obstruction on the line or in need, by suitably disposing these inclined planes, they are made to operate upon the steam valve of the engine, which is fitted with suitable levers or parts, always in position to be acted upon by the inclined planes, whereby the train may at any time be brought to a stand without the co-operation of either engineer or guard.

"When the inclined plane or inclined planes or other suitable "contrivance is required, it is thrown into action by an excentric "or other suitable contrivance, moved by a handle or other "means placed in some convenient situation, or, when desirable, "it may be kept permanently in action." "The apparatus "attached to the locomotive engine for the purpose of moving "the regulator, and thus shutting off the steam, is more or less "independent of the regulator, that the regulator may not be im-"peded or strained, and that it may be moved at the required "time whatever its position."

[Printed, 4*d*. No Drawings.]

A.D. 1860, December 20.—Nº 3128.

SYKES, Thomas, and SYKES, Benjamin Clifford.—This invention relates to smoke consuming and fuel economising furnaces, applicable to the generation of steam, vaporation of fluids, melting and smelting metals, distillation of matters, and general heating purposes. The different arrangements and modes of construction to suit the various applications of the invention are numerous, each varying more or less in detail, but all containing one general principle, which consists in constructing furnaces in an upright position arched over with brickwork, and contained within three brick walls, the fourth or front being occupied by the

feeding door at top, the draught doors enclosing the vertical fire bar surfaces lower down, and below in some cases, the draught door to a horizontal set of grate bars. Within the body of the furnace, between the front internal grate bar surface and the back wall, a number of slanting fire brick bars or supporters containing air passages, are placed one above another so as to support the back of the burning mass of fuel, their ends being built or let into the side walls of the furnace, so as to leave an intermediate space between each. The grate may be composed of either horizontal or vertical bars; they are arranged in front of the furnace; the fuel is fed at the upper part of the furnace front, and gradually sinks down between the fire-bar surface and the slanting bars, so that the fire bed may be said to stand on end. The products of combustion and flaming gases pass off through the intermediate spaces between the slanting fire-brick bars from the green fuel at top, and are encountered by the intense heat emitted from the incandescent fuel below and consumed. Air is admitted through passages in the sides and roof to assist combustion, whence also air is supplied through perforated pipes to the interior of the furnace; the burning heat generated, passes off to its use through a flue passage low down in the back furnace wall. The invention is illustrated in its application to steam boilers containing internal furnaces, wherein all the solid brick-work of the other furnaces is substituted by double metal casing containing water space. A powerful circular furnace, suited to smelting and other purposes, is also illustrated and described.

[Printed, 1*s*. 1*od*. Drawings.]

A.D. 1860, December 21.—N° 3141.

HUNT, THOMAS.—This invention in apparatus for supplying steam generators with water, consists in adding a water chamber or cistern to "Gifford's feed water injector," which is therefrom more regularly and continuously supplied.

The cistern is placed close to the steam jet nozzle of the injector, or it may be made to surround such portion of the injector and submerge the nozzle. The cistern must be capable of holding sufficient water to "feed the injector at a uniform rate, and neu-" tralize any reaction in the current of the water between its " source and the injector."

[Printed, 6*d*. Drawing.]

A.D. 1860, December 28.—N° 3177.

BIRKBECK, George Henry.—(*A communication from François Jules Chéry.*)—(*Provisional protection only.*)—This invention relates to smoke consuming furnaces. The fire bars are disposed in a frame supported by wheels, on which it can be moved on a tramway in and out of the ash-pit; means for moving or causing every alternate bar to slide to and fro are provided; the front dead plate is placed somewhat above the level of the furnace bars, and conveniently above it a hopper is placed, whence the coal is fed by means of a ram or feeding instrument, which is caused to slide to and fro at the bottom of the hopper, each time forcing into the furnace small and regular quantities of coal, as the fire bars recede and advance. The gas and smoke evolved from the fuel, is ignited and consumed by coming in contact with a current of air, heated during its passage through a pipe passing under the furnace bridge to a chamber in front. The fresh fuel is gradually brought in contact with the incandescent, as by the action of the fire-bars it is slowly moved through the furnace to the far end, where currents of cold air from the ash-pit are admitted to complete the combustion.

[Printed, 4*d*. No Drawings.]

1861.

A.D. 1861, January 1.—N° 4.

HENRY, Michael.—(*A communication from Jean Baptiste Edouard Plainèmaison.*)—This invention relates to the so constructing of slide valves, that when working, friction and wear shall be prevented by the absence of steam pressure. The valve used is an ordinary slide valve; the back being got up to a true surface, is covered by a plate which rests upon inclined planes within the steam-box: two springs prevent the plate, which is furnished with a lubricator, from sliding on the valve when it moves from its supports. The principle of construction is based upon the following hypothesis, "When the body of a weight is placed on an "inclined plane, so that the tangent of inclination equals the "coefficient of friction, the body will remain in a state of equi-"librium."

[Printed, 8*d*. Drawing.]

A.D. 1861, January 2.—N° 10. (* *)

TAYLOR, John, and COOPER, Meshach Brittan.—" Im-
" provements in the construction of rotary engines."

These improvements relate to an engine for which John Lane and John Taylor obtained a Patent, numbered 1259, on the 2nd June 1855.

"The improvements consist, firstly, in constructing the 'tongue-" 'piece' with one or both of the sides concave or convex.

"Secondly, in forming the metallic surfaces which abut or act " against the said 'tongue-piece,' with concave or convex " surfaces.

"Thirdly, in using spiral or other springs to keep the metallic " packing close to the ends of the piston or the cylinder ends or " covers.

" And, fourthly, in having the induction ports in the cylinder " ends or covers so that the piston may act as the 'cutoff,' and " allow steam or other vapour to be used expansively." The foregoing improvements are not exclusively applicable to motive-power engines, as they may be employed to make parts of such engines when used for blowing or exhausting air, lifting or forcing water, and for various other purposes.

[Printed, 10*d*. Drawing.]

A.D. 1861, January 3.—N° 14.

FULLER, William Coles, JAQUES, James Archibald, and FANSHAWE, John Americus.—This invention relates to valves of steam and other engines, pump buckets, packings, &c., and consists in adapting to such and other uses, a compound called by the inventors "junction rubber," composed of vulcanite or hard india-rubber united with soft vulcanized india-rubber during the process of vulcanizing. For stop valves in use for steam or water, the hard rubber is faced with soft material, such being either moulded to the required form or cut out of "junction " rubber" prepared in sheets for that purpose. When the two materials are united otherwise than by layers or sheets, scarf joints are preferred as giving greater holding surface, the hard vulcanite being introduced to form the part where strength and rigidity is necessary, and the soft vulcanized for the pliant or elastic part; in cases where the pressure is very great, the valve may be

strengthened by a thin layer of the vulcanite. Packings for piston rods are made in soft rubber rings lined with vulcanite; also packings for screw-propeller shafts of the "junction rubber" are so accurately fitted, that the gland may be removed at any time. Rings for hydraulic rams are moulded to the required shape, and sockets or tubing are made for steam and other engines, apparatus or uses, either hard or soft, inside or outside, to suit the required purpose. "Junction rubber" is also applicable as machine bearings and seats for plummer blocks.

[Printed, 8*d*. Drawing.]

A.D. 1861, January 5.—N° 39.

HAMILTON, JOHN.—(*Provisional protection only.*)—This invention for governing and regulating steam and other engines, relates to those descriptions of governors which depend for their action upon a fly-wheel combined with a re-acting spring, for converting rotary into the longitudinal motion of the sliding sleeve. Friction blocks are applied to the rim of the fly wheel, so that the time during which the fly-wheel part of the apparatus is retarded shall be in relation to the other parts of the governor or re-acting spring, and thus prevent the over-running of the fly-wheel, and thereby regulate the duration of the frictional retardation. The blocks are mounted on lever arms suitably weighted and vibrating on studs or pins projecting from the side of the fly-wheel; the lever arms may have springs to keep the friction brakes out of contact, and to assist in regulating their action. Amongst other things suggested, instead of using the fixed arm and brake block, a frictional band with adjustable spring interposed may be made to act on the periphery of the fly-wheel, by apparatus connected with the sliding sleeve.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 9.—N° 52.

ADAMSON, DANIEL.—This invention relates to steam engines. A series of three or four engine cylinders are disposed in a line, so that all their piston rods are cottered to one cross-head; to the first cylinder, which is of small diameter, high-pressure steam is supplied; this cylinder exhausts into the second in the series, which is about *double the geometrical* area of the first; the second *exhausts into the third,* which is double its area, and the third

into the fourth which is of increased size; thence the steam passes to the condenser. The connecting rods are jointed to the ends of the beam; the bucket of the air pump is worked from the centre of the cross-head, between the second and third cylinders; all the pistons and slide valves have simultaneous action. The steam may be superheated as it passes through the cylinders by the external application of heat within casings filled with heated air or high-pressure steam; the steam may also be superheated in its passage from one cylinder to the next in the series, in the manner described in the Specification of Letters Patent, granted to this inventor and to Leonard Cooper on the 12th of August 1852, No. 14,259, or by any other suitable means. When the principle is applied to beam engines, two of the pistons on each side of the fulcrum are connected to each limb of the beam by ordinary parallel motions.

[Printed, 10*d*. Drawing.]

A.D. 1861, January 9.—N° 57.

DAWSON, Charles Sorby.—(*A communication from William Kennish*.—This invention relating to rotary engines, consists of a fixed closed cylinder, concentrically through which is passed a hollow shaft, whereon within the cylinder is mounted a barrel or paraboliformed piston, whence springs a volute wing piece, which reaches in an oblique curve to the inner surface of the cylinder, and so divides the annular space between; two broad longitudinal grooves are diametrically sunk into the interior of the cylinder, into which flap valves are carefully fitted, so as to preserve the configuration of the circular surface, and permit the outer edge of the volute curved piston wing to pass over water or steam-tight without obstruction. Within the hollow shaft is fitted a cylindrical valve, the openings in which when the apparatus is in full action, are brought to coincide with passages through the hollow shaft, which communicate with parabolic curved passages through the barrel, and open into the annular space under the curved piston wing. The water or steam is cut off by altering the position of the circular valve, in which there is a transverse division, forming separate passages for supply and exhaust; as the force of the water or steam drives round the piston wing, the flap valves in succession are closed to allow it to pass, and opened as soon as the wing is clear, thereby forming successive resisting

abutments to the fluid current on its passage through the apparatus. Modifications and suggestions are made and described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, January 10.—N° 62.

MOULTON, Stephen.—This invention relates to a mode of combining or imbedding thin steel in the form of rings, plates, strips, volutes, spirals, &c., in prepared india-rubber mass, previous to its being moulded into form for springs, valves, and other purposes, before such mass has undergone the vulcanizing process, the object being to strengthen the power of such manufacture when used for springs of carriages, railway engines, buffers, likewise valves of various kinds, and other apparatus, without interfering with its elastic or pliant quality; these steel strengtheners are so arranged and disposed within the moulds as to give material support against the most constant strain, either spirally, radially, longitudinally, or otherwise, previous to the plastic mass being pressed therein, and they are so placed within the limits of the moulded form, that every portion of steel is completely embedded; all the known processes of curing, or, by a heating process, chemically combining sulphur with india-rubber, are applicable to the subsequent process to which the moulded forms of steel and mass are subjected, which process is fully described by W. E. Newton, in his specification dated 30th January 1844, No. 10,027, and by this inventor, in his specification, dated 8th February 1847, No. 11,567.

[Printed, 8*d*. Drawing.]

A.D. 1861, January 11.—N° 79.

CHELLINGWORTH, Thomas Tertius, and THURLOW, Jonathan.—(*Letters Patent void for want of Final Specification.*)—This invention relates to so mounting the boilers of traction engines on trunnions, that whatever the gradients of the road may be, a horizontal position shall be maintained. A pendant lever with a heavy weight, is arranged to hang down on one side of the boiler from a fixed centre. The front of the boiler is supported by a vertical screw pin jointed thereto; a bevelled pinion tapped to the thread of the screw, works thereon as a nut, and gears into another bevelled pinion on an axis at right angles; fixed upon this axis are two ratchet wheels acting in opposite

directions, and a double pall is so arranged to work upon an oscillating centre above, that so long as the boiler remains in a horizontal position, neither of the palls engage with the ratchets, and there is no movement of the pendant lever; but so soon as the travelling surface inclines from a level, either up or down, the lever causes that pall to engage with its rachet, which acts upon the bevelled pinion nut in the direction to restore the horizontal position of the boiler.

It also relates to superheating the steam for traction engines. A chamber formed with a hollow partition to increase heating surface, is placed in the smoke chamber; the products of combustion impart heat to this chamber externally, which heat passes through the metal and is absorbed by the steam current within. Arranging safety valves to blow off into the feed-water reservoir, through a coil of pipe, in order that the heat contained in such steam may not be lost. Steering traction engines by means of a worm and worm segment, instead of a wheel and pinion. The so forming the frames of traction engines, that the main axle shall be supported outside as well as inside the driving wheels.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 12.—Nº 90.

WARWICK, Thomas.—(*Provisional protection only.*)—This invention relates to "governors for steam and other engines." A weighted lever is jointed to an axis which revolves in suitable bearings; a collar, which slides upon the axis and rotates therewith, is actuated by a connecting rod jointed to the opposite end of the lever; fitted to a projection on the sliding collar is a friction roller, which acts on two inclines in connection with the throttle or other valve, to open or close it according to the position of the sliding collar in relation to the centrifugal expansion of the weighted end of the lever, which is due to the speed of the revolving axis. For marine and movable engines, two arms or vanes angularly adjusted, with a perpendicular shaft, rotate under water in a vessel, causing a roller to rise or fall, whereby the throttle or other valve is actuated.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 12.—Nº 92. (* *)

FITZ MAURICE, William Edward.—"Improvements in "*generating heat* for locomotive, marine, and other boilers and

"furnaces." The invention consists, firstly, in "the application "of oxygen gas or of a mixture of oxygen gas and atmospheric "air along with steam, when passed into or through strongly "heated carbonaceous matter, in order to resolve such steam into "hydrogen gas, or this mixed with carburetted hydrogen and "carbonic oxide for the purpose of applying such products as "fuel." Secondly, in causing the mixture of gases to impinge on the vessel to be heated—"I use a number or serias of double "concentric jets, through the central one of which jets I force the "inflammable gases, and through the outer one the atmospheric "air." Thirdly, in the application of oxygen gas or of a mixture of oxygen gas and atmospheric air in the place of atmospheric air only as the supporter of combustion of fuel.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 12.—N° 94.

MATHESON, HENRY.—This invention for generating steam consists in arranging, within a metal casing, in spiral coils around a central furnace, one, two, or more water pipes which are connected to a water chamber at the base of the apparatus; supported upon the casing is the main reservoir, which receives the feed water from the feed pump; the upper ends of the spiral coils pass upwards into the reservoir, reaching towards the top which is the steam chamber, where they discharge the steam generated within them by the furnace below; a safety valve is mounted on the steam chamber: the water chamber below is supplied by an external pipe connected to the reservoir. The furnace is fed through a door and shoot near the top of the casing; the discharge flue is on the opposite side; the flaming gases are made to circulate through the spiral coils by a spreading plate which is fitted with a damper to regulate the draught. Horizontal boilers are arranged on the same principle.

[Printed, 10*d*. Drawings.]

A.D. 1861, January 12.—N° 95.

"ENTISS, ELIJAH FREEMAN.—(*A communication from D. H. liams.*)—(*Provisional protection only.*)—This invention, relating pparatus for regulating the flow of gas, and which is partly icable to the valves of steam engines, has for its object the lization of the pressure it flows from the gas-holder

to the burners, or of the flow of portable gas when highly compressed and used for illuminating purposes. A closed chamber is interposed between the gas main and the burners, so that all the gas consumed passes through the chamber, into which the admission of the gas is regulated by a conical cock or valve, which acts on the rotary principle. The entrance passage along the axis of the valve meets a diametral passage about mid-length, through which the gas passes laterally in both directions into a chamber or cavity in the valve seat, whence another tranverse passage communicates with an exit passage, also in a line with the axis, so that the pressure of the gas by this arrangement is made equal on both sides of the valve, which is operated by a lever arm eonnected inside the chamber with the flexihle sides of a compressible box, which yield to external pressure. The foundation of the flexible sides of the box consists of thin brass bands, wound into a convolute coil and enclosed within an elastic air-tight covering. The pressure of the gas upon the exterior of the box causes its flexible sides to collapse or yield more or less to any regulated pressure, whereby at such pressure the valve is made to operate. The interior of the box communicates with the atmosphere by means of a pipe.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 14.—N° 107.

JOHNSON, John Henry. — (*A communication from Jean Joseph Etienne Lenoir.*)—This invention relates to that kind of motive-power engine wherein a piston within a cylinder is caused to traverse to and fro by the sudden expansion therein of the air contained, which expansion is caused by the ignition of inflammable gas, as described in his prior invention, for which Letters Patent, bearing date 8th February 1860, N° 335, were granted to this patentee. The present invention consists of a peculiar form of distributing valve for effecting the simultaneous admission of air and inflammable gas into the cylinder in alternate layers or strata. The slide valve is provided with a number of small tubes, through which gas from the receivers passes into the cylinder and between each tube, with an opening for the simultaneous admission of air. In order that the stratus may be maintained within the cylinder, plates forming thin separate conducting passages *are used, and* a certain amount of steam, moist vapour, or misty *spray is likewise* or can be admitted, and the impulse of the

engine considerably increased by its sudden expansion. Water circulates through surrounding jackets, whence the spray is obtained. The gas is ignited by an electric spark, which is alternately produced at each end of the cylinder by suitable apparatus in connection with a battery; the gas and air being drawn in by the piston, and the engine kept running at the commencement of the stroke by the momentum of the fly wheel. The electric current may at any time be broken by means of a commutator. The apparatus used is known as "Ruhmkorff's," which with its battery is enclosed in the hollow base plate of the engine.

[Printed, 1*s*. Drawings.]

A.D. 1861, January 15.—N° 111.

SPENCER, John Frederick.—(*Provisional protection only.*)—This invention relates to the working of steam engines. 1. Consists in supplying condensing water to a surface condenser, from pumps driven by an auxiliary engine supplied from an auxiliary, or from the main boiler, whilst the other pumps are worked by the main engine, the object being to fit inexpensively surface condensers to engines already provided with ordinary injection condensers and air pumps. 2. Relates to a mode of working the combined air and cold water pump, or only the latter, in connection with the arrangements for surface condensing patented by this inventor on the 29th March 1858, N° 661, and on the 17th January 1860, No. 120. The plunger of the combined pump or other force pumps is worked by means of a lever or levers attached by one end to the piston rod crosshead, the other end being a rocking centre connected to the framing; motion is communicated to the plunger by connection to the lever at the point which corresponds in length of traverse with the stroke of the pump. By this arrangement the load on the pump on its downward stroke assists to counterbalance the weight of the steam piston and parts moving therewith. 3. Relates to a mode of replenishing the waste of fresh water, economizing fuel, and raising the temperature of feed water. Salt or turbid water, or both, are vaporized by contact with the surfaces of thin metal plates, heated on the other side with steam or water from the main boiler. The steam thus generated from the salt or turbid water is made to heat the feed water on its passage to the condenser.

[Printed, 4d. No Drawings.]

A.D. 1861, January 15.—N° 114.

WILSON, Robert.—This invention relates to screw propellers, steam engines, and boilers. The propeller is an ordinary two-bladed screw, made by preference of malleable iron, with the blades slightly increasing in convexity on both surfaces, in circular section, from their extreme ends to the central boss, near which they lose on each side a portion of their width. The edges all round the blades are made fine, and their extremities so thin as to give them a slight degree of flexibility.

The engine, as arranged for driving a screw propeller, has two inverted cylinders disposed upon a frame above the propeller shaft, upon which the pistons act direct; one end of the crank shaft is coupled to the propeller shaft; the other end carries a disc, which, by means of a fixed stud and connecting rod, actuates a lever arranged on a level with the lower ends of the cylinders; this lever works the air and bilge pumps. By means of the disc the propeller may be moved round when the engine is not in motion.

The boiler consists of a horizontal cylindrical shell, with two internal tubular furnaces opening into a combustion chamber at the back, which is surrounded with water space. The flaming gases and products of combustion take an upward course and pass through groups of return tubes over the furnaces to the front into a projecting chamber connected with the chimney uptake. To prevent priming curved and other formed plates are disposed in the water space about the tubes and furnaces, for the purpose of bringing the less heated portion of the water into contact with the hottest surfaces. The steam is superheated in a jacket which surrounds the uptake, within which is a spiral coil of pipe for heating the feed water. Modifications of details are suggested and described.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, January 19.—N° 157.

CLARK, William.—(*A communication from Andrew Buchanan and Peter Zeglio.*)—(*Provisional protection only.*)—This invention relates to balancing slide valves of steam engines, applicable to *slide valves in which* the steam from the boiler is admitted to the *under side. It* "consists in combining with a slide valve a

"common conical valve guided by a stem, and enclosed in a "steam-tight chamber, and otherwise arranged, as will be herein- "after more fully explained, so that the area of the lowest and "undiminished surface of said valve is in proportion to the upper "surface of the same (the latter being diminished by the dis- "placement of the stem to which it is attached), as the upper "surface of the slide valve is to the channels and steam passages "in the face of the slide valve, and that by the natural tendency "of said cone valve to follow the action of the steam on its "lower and larger surface, the pressure exerted by the steam on "the two sides of the slide valve is equalised." "Arranging on "the hollow stem of said cone valve a loose cap (with short legs "projecting therefrom) shutting down over suitable apertures, "for the purpose of facilitating the entrance of the steam." Arranging the cone valve on a movable seat, with the loose cap and regulating pins in such a manner that the steam remaining above the slide valve shall return to the steam pipe. Preventing any lift of the slide valve by the use of a steam pipe above it in direct communication with the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 21.—N° 159.

ALBRECHT, Charles Edmund.—(*Provisional protection only*.) —This invention relates to apparatus for measuring the pressure of steam and other fluids. A piston is carefully fitted into a cylindrical tube, one end of a spring is attached to the piston, and the other end to the end of the tube, so as to make an indicator actuated by the piston, to stand at zero on a dial which has been graduated to correspond with the resisting power of the spring. When desired to try the pressure of steam it is admitted to one end of the cylinder, and, either by compression or otherwise, acts through the piston upon the spring until it ceases to yield and is capable of withstanding the expansive force of the fluid; the amount of pressure will then be indicated on the dial.

"For barometers, or in certain other applications, a vacuum is "produced in the cylinder or chamber on that side of the piston "which is opposite to that directly exposed to the pressure, the "end of the cylinder or chamber in that case being closed her- "metically or stanch on the side where the vacuum is obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 23.—N° 186.

PRINCE, Alexander.—(*A communication from Thomas Goodrum.*) —(*Provisional protection only.*)—This invention of an induction and eduction valve for steam engines, "consists of a hollow "cylindrical or conical valve of peculiar construction, which "receives a rotary motion corresponding with that of the engine "shaft, and may control the induction and eduction of steam to "and from one, two, or more cylinders.

"It also consists in an appliance to the said valve to serve the "purpose of a variable cut-off, and" "in a certain manner of "arranging the said valve, whereby the steam passages leading "from the valve to the cylinder or cylinders are shortened to the "greatest possible degree."

[Printed, 4d. No Drawings.]

A.D. 1861, January 24.—N° 188.

HAWORTH, Thomas.—This invention relating to apparatus for governing or regulating the speed of steam or other motive power engines, consists in the use of two pairs of governor balls. The upper or main pair give a simple up and down motion to a shaft contained within the governor spindle, which shaft opens or closes the throttle valve as it is moved up and down by the action of the main governor balls; the supplementary balls, which are arranged either on the same level as the main pair or below, are connected with a tubular shaft also within the spindle, and within which shaft the main governor shaft acts. A spur, or friction pulley, actuated by the supplementary balls on the tubular shaft, gives backward or forward motion, by means of two friction pinions mounted on vertical spindles in a frame, to other pulleys and gearing as it rises and falls, and these communicate with the upper part of the main governor shaft, through a toothed wheel connected to it by a spring and catch arrangement; the upper end of the shaft is screw threaded, which actuates a nut connected with the lever of the throttle valve, whereby the movements of the throttle valve are regulated with regard to the normal speed of the engine.

[*Printed, 6d. Drawing.*]

A.D. 1861, January 24.—N° 190.

MULHOLLAND, Frederick George.—(*Provisional protection only.*)—This invention relates to preventing steam boiler explosions, and decolorizing gaseous products of fuel. A float is connected by a rod to a piston working in a cylinder, so perforated as to allow an escape of steam whenever the float sinks below a certain level. "To the head of the piston rod a link is attached, the " other end of same being keyed on to a spindle (passing through " an enlarged head-piece or bonnet having a steam and water- " tight division therein), to which motion being imparted (by the " vertical action of the piston rod) a valve is worked in one of " the chambers, to which the usual feed pipes are connected, or " otherwise whenever convenient, and preferentially to a sup- " plementary supply direct from the cistern or other source." A whistle attached to the bonnet sounds whenever the steam escapes, caused by the float sinking below the perforations in the cylinder. The feed water is conveyed into a hollow bridge or chamber, in immediate contact with the fire. The ash-pit being closed, the supply of air is conveyed through tubes to the hollow bridge and becomes highly rarefied, and by acting only on the surface of the fire the bituminous products of each fresh charge of fuel are forced through the incandescent body below, whereby they become decolorized.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 25.—N° 203.

LAW, Jesse.—This invention relates to apparatus for shutting off the steam and operating the breaks of engines employed at mines or pits, whereby overwinding of the cages and the accidents resulting therefrom are prevented. It consists of a horizontal screw shaft, which may be a prolongation of the driving or other shaft of the engine employed. A hole through the end of a pendent lever is tapped with a screw thread of the same pitch as the screw on the shaft, so that it will work thereon, and as the engine crank revolves in either direction the pendent lever also correspondingly traverses the screw shaft. The length of traverse of the lever is determined by set nuts, regulated in accordance with the length of the rope to be wound up from the pit. When the engine is started it goes on winding up, and the pendent lever traverses the screw until the cage at the end of the rope arrives at

or near the surface, at which point the set nuts are regulated to act upon the lever, which is raised and caused to strike against catches or stops on the ends of two horizontal levers, one of which is connected to and applies the engine break, and the other by connections with the slide valve shuts off the steam or reverses the engine; if the latter, or when the engine is reversed, the lever traverses to the other end of the screw shaft, and there acts upon two other levers with the same result. Two cages or skips are employed, which are alternately brought to the surface, one ascending whilst the other simultaneously descends. The invention may be adapted to existing arrangements.

[Printed, 6*d*. Drawing.]

A.D. 1861, January 26.—N° 212.

JOHNSON, John Henry.—(*A communication from Auguste Prouvost.*)—This invention relates to obtaining motive power from the expansion and compression of air, gas, or vapour, and to the "pyrometer" engine, or apparatus for reworking such fluids or vapours indefinitely without loss or escape, and particularly by their regeneration after producing their dynamic effect. The "double pyrometer," worked by both air and steam, regenerates the caloric and the molecules; it consists of two working cylinders with supplemental chambers or lungs, a superheating generating apparatus, a saturating regenerating apparatus, and a refrigerating apparatus. The "superheating "generator" consists of a serpentine pipe, coiled round and embedded during the process of casting within the sides of a cast iron furnace, which is surmounted with a vertical tubular chamber or steam generator, through which the flaming gases rise from the furnace fire. The saturator, which also acts as a regenerator, consists of a horizontal cylindrical chamber, covered at one end by a cap, which affords communication to the series of pipes within; these pipes are closed at their lower ends. After the steam is expanded, it is forced back into this chamber, where it is saturated and the caloric concentrated, "the compressed air "being heated in the tubes by depriving the steam of its caloric "in order to exert its expansive force in the air cylinder." "The refrigerator or cooling apparatus is surmounted with a "*chimney*, and it is also formed of tubes open at both ends, "*through which* the atmospheric air passes, and carries off and

"disperses the caloric of the compressed air contained in the "interior of the case, to serve as the counter pressure of the same "air cylinder." The two working cylinders are furnished with four "lung" chambers; they are "for the purpose of effecting "repercussive reactions at each stroke of the piston by means of "the two reservoirs of different pressures and temperatures, "although of the same density, the one acting so as to equalize "the pressure, the temperature, and the density in the 'lungs' "during two strokes of the piston, whilst the other acts so as to "produce the same effect during the negative stroke; expansion "or the positive stroke takes place during the opening of the "orifice, which places the 'lungs' in communication with the "cylinder, whilst the negative stroke takes place only when the "orifice is shut." The working cylinders of the double pyrometer are horizontally disposed lineable with each other, so that the two pistons are fitted on one piston rod, which by means of a connecting rod gives motion to a crank shaft in the usual manner. The pyrometers are constructed with one, two, or more cylinders.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1861, January 28.—N° 228.

SHIPTON, JAMES ALFRED.—This invention, relating to rotary steam engines, consists of a pendulous steam chamber suspended from a fixed cross beam supported by vertical standards. Suitable passages, communicating with the interior, are formed for the admission and emission of steam. The space or cavity within the chamber is somewhat elliptical, or, say, formed by two hemispheres united with short parallel sides; the ends are parallel with each other. Mounted eccentrically upon a shaft which passes through the centre of the chamber there is a circular piston which fits and revolves between the parallel sides of the interior. Rotary motion is given to the shaft by the force of the steam acting against the major radius of the piston, which revolves within the chamber, alternately each revolution filling the two hemispherical ends of the cavity, whilst the chamber, by its pendulous liberty to oscillate, accommodates itself to the motion caused by the revolutions of the excentric piston which is mounted on the shaft, and revolves in fixed bearings.

[Printed, 8d. Drawing.]

A.D. 1861, January 30.—Nº 254.

LONGRIDGE, Robert Bewick.—This invention, for promoting the circulation of water in steam boilers and in supplying water thereto, consists in the use of apparatus forming a connection between the highest water level in the boiler and the lowest water spaces, wherethrough by the pressure of steam upon the surface water, sometimes assisted by the impulse of a jet of steam, the water is kept in a state of constant circulation. The circulating apparatus is shown attached to the front of a horizontal cylindrical boiler fixed upon a vertical pipe which through a flap valve communicates with the lowest water space beneath the ash-pit. Branching right and left from the top of the apparatus, with a stopcock in each, are two pipes which turn and enter the end of the boiler at the water level; the end of one branch within the boiler, through which the outflow of water courses turns down below the water level, and the end of the other branch, which is for the emission of steam, turns up into the steam space. The water outflow pipe takes a downward course within the case of the circulator, the pipe therein terminating in an inverted conical nozzle, the centre being in a direct perpendicular line with and a short distance above the centre of a conical nozzle with which the vertical pipe terminates within the case, the ends of both nozzles being open for the passage of the water. When the stopcock in the water outflow branch is open, the water driven by the steam pressure rushes out in a continuous jet through the end of the inverted nozzle with great velocity and impulsive force direct into the nozzle of the vertical pipe, thence passing down into the bottom of the boiler. The steam branch of the circulator terminates in a cone or nozzle within and concentric with the inverted conical nozzle at the end of the water branch; one is so placed within the other as to leave an annular space for the passage of the water. By the additional impulse of the steam jet, which if taken from a separate boiler must not be below the temperature of the water jet, the velocity and impulsive force of the water jet is increased. Boilers are supplied with feed water by means of the circulating apparatus slightly modified. The steam branch is not required. The inverted conical nozzle on the end of the water outflow pipe is raised and so placed concentrically within another cone in connection with the feed water supply as to leave a thin annular

space between them, the nozzle of the outer cone being superposed in a direct central line through the inverted cone and the nozzle of the upright cone on the vertical pipe. When the feed water is turned on the velocity and force of the hot water jet combines with and impels the feed water through the nozzle of the upright cone and down the vertical pipe into the bottom of the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1861, January 31.—N° 261.

WARREN, Sylvester Wiggin.—This invention relates to a water level indicator for steam and other boilers; it consists in so arranging a metal tube in relation to the water level of the boiler, that while the water is at a safe working level in the boiler the tube shall be filled with water comparatively cool, but so soon as the water level sinks below the level of the tube it is filled with steam which expands the tube and thereby compresses a curved spring; the then altered form of the back of the spring raises the steam valve and allows an escape of steam through the whistle, which has two or more mouths at different distances from the steam orifice, and is so constructed as not to be affected by the water of condensation. When the water is too high in the boiler it is, by means of a syphon, made to circulate through the metal tube, which is then expanded by the hot water, producing the same effect on the curved spring to raise the steam valve and sound the whistle. The gauge glass, inserted in metallic sockets, is arranged parallel to the metal tube, with a stopcock top and bottom; there is also a stop valve at each end of the metal tube to temporarily close its connection with the gauge but not to stop its operation.

[Printed, 8*d*. Drawing.]

A.D. 1861, February 1.—N° 272. (* *)

NEWTON, Alfred Vincent.—(*A communication from W. H. C. Voss.*)—" An improved construction of motive power engine."

This invention relates to a novel arrangement of engine for obtaining rotary motion from water by the aid of steam pressure.

" In this improved engine three stationary steam-tight cylindrical " chambers are employed, the middle one being fitted with a " *turbine of any approved construction*, mounted on a vertical

"shaft which turns in bearings carried by the cylinder heads. "This middle cylinder is connected to each of the side cylinders "by means of two pipes, one of which (from each cylinder) "enters the middle cylinder above the face of the turbine, and "the other below the turbine. Each pipe is governed by a shutter "valve, the slats or shutters in the upper pipes opening inwards "to the middle cylinder, while those in the lower pipes open to "the side cylinders. These two side cylinders are connected "together at top by a branch steam pipe leading from a boiler, "and in the prolongation of these branches (within the cylinders) "cut-off valves are mounted. By the axial motion of these "valves the steam is cut off, and exhaust pipes brought into con- "nection with the cylinders, The working of the valves is "effected by annular floats suspended in the cylinders from "pendent rods, which by means of cranks and horizontal rods "are connected to arms keyed to the bottom of the valve "spindles. To ensure the proper relative action of these valves "the upper ends of their spindles are connected together by "means of short levers which they carry, being coupled by an "adjustable coupling rod. A driving pulley is keyed to the "turbine shaft for transmitting the rotary motion of that shaft "to the mechanism to be driven by the engine."

[Printed, 10*d*. Drawing.]

A.D. 1861, February 2.—N° 280.

CAMERON, JOHN.—This invention, relating to the purification of water for the supply of steam boilers and for other uses, consists in mixing with the water previous to use a certain quantity of decayed vegetable ligneous matter, such as peat, black vegetable mould, leaves, roots, or fresh vegetable matter charred with acid. The organic compounds contained in these substances, such as humin, ulmin, humic acid, ulmic acid, crenic acid, and apocrenic acid, have a powerful affinity for the lime, magnesia, oxide of iron, and alumina contained in the water, and when combined form insoluble precipitates, which fall and leave the water pure and soft. Two cisterns, or a tank in two compartments, arranged on different levels, so that all the contents of one will flow into the other or lower compartment, are employed, each cistern or compartment of sufficient size to contain about 25,000 gallons of water, and the upper one in addition 30 tons of peat, more or less dry, so that

some portions will sink to the bottom of the compartment whilst other parts swim on the surface. In this state it is left for a certain time, until by occasional testing it is ascertained that the calcareous and other earthy matters previously contained in the water have been precipitated. The water is then run off into the lower compartment and the upper is refilled; stirring occasionally is necessary in order that the body of water and the peat may equably act upon each other. The required quantity of vegetable matter will vary according to the amount of soluble matters contained in the water. For domestic purposes, three pounds of peat put in will suffice to soften the water for four weeks without renewal, if agitated occasionally during each twenty-four hours, the time required to effect its purification. Vegetable matter may be prepared for the purpose by sulphuric acid, in proportions of 100 lbs. of the former to 2 lbs. of the acid, which latter acts rapidly on all kinds of vegetable produce; peat however is preferred as containing all the requisite amount of organic compound necessary for the purpose.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 4.—N° 287.

LARUE, Juste Sebastien.—(*Provisional protection only.*)—This invention for lubricating pistons and slide valves, consists in placing a cup in such a position "as to permit oil when placed "therein to descend by means of a capillary wick passing through "a small pipe or conduit communicating with a stuffing box. "The end of the piston rod will work in this box, and being made "hollow and open at the end the oil will pass into the rod, and "thence to the piston. The piston rod may be slightly enlarged "in its proportionate diameter to compensate for its being formed "tubular."

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 7.—N° 312.

WILSON, John William.—(*Provisional protection only.*)—This invention relates to vertical steam boilers, and consists in placing a revolving fire grate at the lower part of the boiler, whence the flaming gases pass upwards through tubes placed in a cylindrical shell which forms the lower part of the boiler, into a combustion chamber open to the surrounding flues. The upper

part of the boiler, which constitutes a water level and steam chamber, is connected and supported by a central cylindrical tube within the combustion chamber, to and upon the lower half of the boiler, and forms the water communication between them. The combustion chamber is provided with the means of admitting air to assist combustion; after the flaming gases have left the combustion chamber and circulated round the boiler, the hot draught passes off to the chimney. The air opening to the combustion chamber, the chimney damper, and feed of fuel, may be made self-acting by the pressure of the steam.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 11—N° 338.

MENNONS, Marc Antoine François.—(*A communication from Auguste Casimir Lehot.*)—This invention, relating to the heating surfaces of steam boilers and engines actuated by aeriform fluids, and to the cooling surfaces of condensers, consists in the application of metallic gauze or web to such surfaces with a view to obtain a more rapid diffusion of caloric than is effected by the ordinary tubular and other analogous arrangements previously employed. The metallic gauze or web is secured to the heating or cooling surfaces, and in such a position as to be always in contact with the aeriform fluid or with the liquid to be vapourized. When applied to locomotive boilers, the tubes externally are covered by over-lappings of the gauze, so as to form a series of spiral layers. The heat evolved in the furnace passes into and through the metal of the tubes, and is diffused by the surrounding spiral lappings of the gauze in contact therewith, and thereby imparted to the fluid contained in the boiler. In stationary boilers of the ordinary construction, and also in flat-sided boilers, folds of the metallic gauze are disposed in contact with the internal surfaces of the heating plates or flues. "The same system is followed in the " application to cooling and condensing surfaces, the mode of " attachment being varied according to the form and general " construction of the apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 11.—N° 339.

MENNONS, Marc Antoine François.—(*A communication from Julien Fradet.*—This invention, relating to the construction

of steam generators, consists in the introduction of spiral or serpentine-formed tubing into the manufacture of steam boilers employed for heating, drying, evaporating, and for other purposes. Taking for example "the apparatus by which steam is supplied "in the different processes of sugar manufacture, a number (say, "two, three, or more) of iron tubes bent in a serpentine form, are "passed into the generator, and are there secured by brackets or "other convenient support in such a position as to expose the "largest possible amount of surface to the action of the steam "and hot water. As a general rule this serpentine should be "placed in the length of the boiler from one end to the other, "but this arrangement may be varied according to the form and "distribution of the apparatus. The free extremities of each tube "are carried through the sides of the generator at any desired "point, and are connected with branch pipes leading to the "different chambers or recipients of the manufactory to which the "steam is to be supplied in passing by the ordinary intermediate "reservoirs, if required. The steam produced in the generator "arranged as above is first carried by the common delivery pipe "and its branches to these chambers or recipients, from whence, "under the continued pressure, it passes to the serpentine, in "which it recovers its last heat, and pursuing its course is again "distributed to the different points at which its action is required. "In this way a continuous circulation is maintained between the "generator and the different series of apparatus with which it "communicates, so that the steam is economised to its fullest "extent." A modification introduces a superheating apparatus composed of serpentine tubes set so behind the register as to be exposed to the flame of the furnace; the steam on its return to the generator is conveyed through this superheating apparatus, which is interposed and constitutes a part of the return passage.

[Printed, 10*d*. Drawing.]

A.D. 1861, February 12.—N° 355. (* *)

PARKES, ALEXANDER.—(*Provisional protection only.*)—Improvements in boiler furnaces, consisting in forming such furnaces, when made of copper, by casting, for which purpose a mould of sand and lime, or, where the copper contains phosphorus, sand alone may be *used*. *The furnace* may be also cast of steel, to

which a small quantity of phosphorus may be added, moulds of sand and lime, or sand alone, being employed.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 14.—N° 375.

SEARBY, GEORGE.—This invention relates to steam and vacuum gauges. It consists in so uniting a series of short vertical tubes by short bends, as to form one close continuous wave formed passage through the whole length; each tube is punctured with a small orifice about its mid-length. The lower half of each tube and connecting bend is filled with mercury, and the upper half with water in the following manner, which is the peculiarity of the invention:—Within a trough containing mercury and water the series of bended tubes is flatly laid, so as to fill the whole length with water, which drives out the air; it is then plunged vertically into the mercury, which enters the orifices and displaces the water up to their level; whilst the tubes are under water the orifices are closed by screws or plugs, or by a plate which covers the line of holes along the series. One end of the series is connected to the steam pipe, and the other to a vertical glass tube, in which the rising and falling mercury indicates on a graduated scale any variation of the steam pressure. When used as a vacuum gauge the action is reversed; the open end of the first tube in the series will be put in communication with the vacuum, the other end being either closed or open to the atmosphere; the level of the mercury indicates the pressure.

[Printed, 6*d*. Drawing.]

A.D. 1861, February 20.—N° 419.

VAVASSEUR, JOSIAH.—This invention relates to upright steam boilers. The shell of the boiler is cylindrical; suspended from the top of the furnace, which rises to about the mid-height of the boiler, there is a funnel shaped water space or chamber, the tubular stem of which passes centrally down through the furnace bars into the ash-pit beneath, and is there connected to a blow-off cock. Around the top of the furnace there is an arrangement of vertical fire tubes which communicate with the smoke box at the top of the boiler, and form separate passages for the flaming gases through the upper water space and steam chamber; also a central

group of vertical fire tubes, which open over the furnace through the obtuse sides of the central chamber, pass up through the water space and steam chamber, and communicate with the smoke box; the lower ends of these tubes are bent so as to suit the angles of the chamber sides. The fire tubes by passing through the steam space supherheat the steam. The above arrangement is also applicable to horizontal tubular boilers.

[Printed, 8*d*. Drawing.]

A.D. 1861, February 21.—N° 428.

DUTILLEUL, JULES.—(*Provisional protection only.*)—This invention of an alarm and water level indicator for steam boilers consists of a hollow metal float attached to a vertical spindle, which projects through a steam tube out of the top of the boiler; the end of the spindle acts upon a link or lever arm which turns an arbor or axle, one end of which passes through a gland into an enlargement of the steam tube; upon the other end of the arbor a pointer is fitted, which passes round a scale graduated on the external face of the tubular enlargement. When the float rises or falls, the end of the spindle acts upon the link which rotates the arbor and pointer, thereby discovering the correct height of the water level. The extreme safety points of high and low water are signalized by the rush of steam which takes place when the arbor has rotated in either direction to the extremity of its action, and two grooves in the arbor which communicate with the atmosphere are brought coincident with a passage which communicates with the steam chamber.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 21.—N° 430.

MILLER, JAMES JOHN, (the younger.)—This invention relates to governing the speed of steam and other engines and machines by means of a momentum wheel mounted free to revolve upon a horizontal shaft, upon which, beside the wheel, there is a sliding sleeve which is free to slide longitudinally on the shaft, but is compelled to revolve with it by means of a fixed feather; the end of the sleeve and the nave of the wheel bear by oblique inclines upon each other, whereby the wheel is driven, the sleeve being kept in contact with the nave of the wheel by means of a reacting spring. Whenever the engine increases or diminishes in speed, it

is not simultaneously accompanied by a corresponding movement of the momentum wheel, which then, without regard to the direction the engine may be running, by a shifting of the position of the inclines drives off the sleeve which by means of levers and connecting rods controls the movements of the throttle valve. The maximum amount of action on the throttle valve is attained by the relative positions of the sleeve and wheel differing to the extent of one-half a revolution, beyond which, further action in either direction is prevented by means of a fixed stop; the speed for running is fixed by a regulating screw which acts upon the spring.

[Printed, 10*d*. Drawing.]

A.D. 1861, February 21.—N° 432.

NEWTON, William Edward.—(*A communication from Charles Talbot Porter.*—(*Provisional protection only.*)—This invention relates to centrifugal governors for marine and other steam engines and motors. A reacting helical spring is employed on the governor spindle as a counterpoise to the centrifugal force of the balls, whereby the governor is made so to act in a horizontal position, that the deflection of the spring shall bear nearly a constant ratio to the radius of the circle described from the centre of gyration by the balls and arms, whereby the governor is rendered "extremely sensitive to the slighest variation in the speed of the engine." The balls are attached to the jointed arms according to the usual way of constructing vertical centrifugal ball governors, the helical spring circumvests the valve spindle, and bears against the sliding sleeve, to which the ends of the arms are jointed. The spindle revolves in a horizontal position and may be safely disposed at any angle without altering the efficiency of the apparatus, even for marine purposes, where the plane of gravitation is constantly on the change.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 22.—N° 453. (* *)

BARCLAY, Andrew.—"Improvements in pumping engines."

"Under one modification, the cylinder of the engine is arranged "at the side of the mouth of the shaft up which the water is to "be raised. The cylinder is bolted down to a suitable super"structure or foundation, and is placed upon this so as to stand

"quite clear of the mouth of the shaft, or it may project to a "small extent over it. The piston rod is connected to an over-"head beam; the connection to this beam is not made at the "centre, but at such a distance from the end as to allow of the "front extremity overhanging the mouth of the contiguous shaft, "and admit of the easy connection of the pump rods thereto; the "other portion of the beam, which may be about three parts of "its length from the point of connection with the piston rod, "extends backwards away from the mouth of the shaft, the "extremity of the beam being jointed to a vertical rocking shaft, "which serves to sustain the overhanging end; the air pump is "conveniently arranged between the cylinder and the rocking "shaft, the pump rod being connected to the beam overhead. ". . . The arrangement of these engines may also be modi-"fied, so as to have the cylinder fitted above the beam. . . .

"Another arrangement or modification . . . consists in "placing the cylinder immediately at the edge of the shaft, and "connecting it to the beam overhead, the beam being carried in "bearings fitted on a pillar of masonry or wall contiguous to "the cylinder."

[Printed, 10*d*. Drawing.]

A.D. 1861, February 25.—Nº 474.

PINCHBECK, John.—(*Provisional protection only.*)—This invention relating to glass water gauges and pet-taps for steam boilers, consists in so combining them that the cocks required for the water gauge answer also for the pet-taps; each tap of the guage has two distinct channels formed in its plug, which do not communicate with each other: one channel in each plug is a water passage from the boiler into the glass, whilst the other channel in each cock opens the passage from the boiler to the pet-taps and atmosphere; by different positions of the handles the water through either cock is made to flow into the glass or blow through it; also to open the communication between the boiler and the pet-taps. The gauge is mounted on a plate by which it is attached to the boiler.

[Printed, 6*d*. Drawing.]

A.D. 1861, February 25.—Nº 485.

BARLING, John.—(*Provisional protection only.*)—This invention relates to applying motive power to locomotive driving and

paddle wheels, horizontally above their axes, and on the line or direction of motion, and consists, (1), in disposing the cylinders of paddle wheel engines horizontally on a level with the crank or driving shaft, that their piston rods will act at right angles thereto, or, if vertically placed or disposed below such level, the motions of the pistons may be transmitted to the crank shaft through cranked levers, or by other similar arrangements. 2. In so arranging the valves and working gear of locomotive and marine engines as will enable the driver to cut off the steam from the head or fore part of the cylinders while the vessel or train is in motion, or to work the engine at will with the steam on one side of the piston only, the port to the exhaust outlet or to the condenser being kept freely open.

The following arrangement for the valves is preferred:—the surface of the partition which separates the exhaust from the steam port is sunk to accommodate a triangular valve hollow on one of its faces; when single action only is required in the engine, a forward movement of this slide closes the mouth of the steam port towards the steam chest, and opens a constant communication along the hollowed face of the slide between the head of the cylinder and the exhaust; the same arrangement may be made with respect to the other steam port for backward motion if desirable; a separate exhaust port leading from each end of the cylinder to the condenser will admit of the steam being cut off at will from either end of the cylinder.

Printed, 4*d*. No Drawings.]

A.D. 1861, February 25.—N° 487.

YOUNG, James.—(*Provisional protection only*.)—This invention relates to heating apparatus, and consists in the use of refractory materials or substances, such as fire-clay, in lieu of metal for the construction of apparatus for raising steam to a high temperature; fire-clay is capable of sustaining the heat of steam, whilst at the same time it is not prejudicially affected by contact therewith or with heated air.

[Printed, 4*d*. No Drawings.]

A.D. 1861, February 27.—N° 509.

WEALLENS, William.—This invention relates to steam *ngines and boilers*, and to steering and propelling vessels. It

consists, (1), in the use for marine and other purposes, of a two cylinder high and low-pressure engine, the starting and reversing of which is effected by a link or wedge motion, in connection only with the slide of the low-pressure cylinder, and independent of the valve movement of the high pressure cylinder. At starting, the low-pressure valve chest which is provided with a safety valve is charged with high-pressure steam by means of a cock, which when motion begins, is closed, and the cylinder is then supplied with the exhaust steam from the high-pressure cylinder.

2. Relates to the construction of a high-pressure boiler which is similar to a locomotive boiler, to which is added a second cylindrical shell longitudinally fastened upon the main boiler, and containing a set of tubes for heating feed water at the front end, divided transversely from another set of tubes for superheating steam in the back division, in connection with an upright combustion chamber wnich encloses the two back ends; the flaming and heated products of combustion pass from the lower boiler up the combustion chamber into the back tubular division of the top cylinder, which constitutes the steam chamber, and in addition to a group of superheating tubes, contains baffling plates for giving to the steam an alternate lateral course amongst the tubes, as it passes from the admission to the delivery passage; the superheating tubes open into a short transverse chamber, and thence the hot draughts pass through the tubes in the feed water heating chamber, into the front smoke box and away to the chimney.

3. Relates to propelling and steering vessels, which is effected by the use of two screws, respectively placed on each side the stern post and driven by separate engines, acting either singly or differentially as regards speed, so as to assist the helm or entirely steer the vessel. Conjoint action, when necessary, is given to the engines by means of suitable coupling apparatus, which may also be applied to paddle-wheel engines.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, February 28.—N° 515.

WHITTAM, Robert.—(*Provisional protection only.*)—This invention relates to heating feed water for steam boilers. The exhaust steam from either high or low pressure cylinders is made to pass successively through volute spiral passages formed within

each section of a united series of vessels, so placed in the steam passage, that the heat imparted to their external surfaces shall be absorbed by the feed water, as it passes in succession through the volute formed passage within each vessel in the series.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 2.—N° 531.

ELLIS, John, STRINGER, John, and BRADOCK, John.—This invention relates to apparatus for lubricating the moving or frictional parts of engines and machinery. When applied to the piston and piston rod of a vertical engine cylinder, a deep recess to contain the lubricating matter is sunk in the direction of its length into the gland of the stuffing box, and a shallow indent or grooved incline is made in the piston rod, so that when it dwells at the upper end of its action, the indent shall be opposite to small apertures which lead from the bottom of the recess to the inner surface of the gland; whilst the piston is turning the top centre, the apertures in the gland and indent in the piston rod being coincident, the latter is filled by an outflow of the lubricant, which is carried into the cylinder with the downstroke, thus lubricating the piston rod, piston, cylinder, and valve seating. The lubricant may be introduced into the valve box in the same manner, and to other moving parts by lubricators so attached, as to discharge a portion of their contents when openings and indentations in the parts are coincident.

[Printed, 6*d*. Drawing.]

A.D. 1861, March 2.—N° 535.

HENDRY, William.—(*Provisional protection only.*)—This invention relates to the construction of boiler flues and furnaces for consuming smoke, and consists in building two flues at the back of double-tube Cornish boilers, so that the fire draughts from each tube shall cross at the end, and return along the opposite side flues to the front of the boiler, where square vertical draught holes leading down below the flame bed and thence to the chimney are formed in the brickwork; opposite each of these holes a square pipe of cast iron is placed slanting down towards the fire; the passage through these pipes is regulated by valves actuated *by chains, so placed* that when the square pipes are closed the

hot draughts course down through the vertical draught holes to the chimney, and when open the corresponding draught hole is closed and the hot draught is directed through the pipe on to the surface of the fire. The boiler fires are fed alternately at regular intervals, so that by the time one fire requires a feed, the burning fuel on the other has become incandescent, upon which the smoke from the newly fed fire, by a suitable movement of the valve, is directed and thereby consumed, the operation being kept up by simply alternately closing and opening the pipes and holes, so that the smoke from either fire may be consumed in the other furnace. The flues of two single-tube boilers are arranged to cross at the end, so that the smoke or fire draught from one boiler returns by the side flues of the other, the firing of the furnaces of the two boilers being alternate at regular intervals with the same results, which are rendered in all cases more effective by disposing the furnace bar bearings so as to form fire-grate surfaces inclining downwards from the back towards the fire-doors. Pipes through the brick-work may open into the square draught pipes, for the purpose of supplying atmospheric air to the furnaces to promote combustion.

[Printed, 4d. No Drawings.]

A.D. 1861, March 5.—Nº 559. (* *)

BIRKBECK, George Henry.—(*A communication from Narcisse Ponche, Joseph Scellier, and Marie Pierre André Brasseur.*)—"Im-" provements in pistons for pumps, steam engines, or other " purposes."

" When the piston or plunger is required to be single-acting a " series of narrow plates formed with bevil edges are combined " and fitted together, so as to form a slightly conical ring, one end " of each plate being attached to an internal ring, forming the " body of the piston or plunger, and to which the piston rod is " connected. The other ends of the plates are capable of being " expanded by means of a circular plate (fitting the interior cone " of the piston), which is capable of being 'set' up by screws, so " as to cause the outer circumference of the conical piston to ex-" pand, and thus accurately fit the interior of the cylinder in " which it is to work. Pistons of this description may be made " with two conical cylinders, as above described, placed with the " two *internal rings or bodies* against one another, so as to

" expand at each end, and thus make a tight joint at both ends " when the piston or plunger is required to work with a double " action."

[Printed, 6d. Drawing.]

A.D. 1861, March 6.—N° 573. (* *)

HODGSON, JOSEPH.—(*Provisional protection only.*—" Improve-" ments in the pistons of steam engines, and in the buckets and " plungers for pumps."

" It is proposed to employ two bevelled or wedge-shaped " metallic split packing rings, which are let into an annular recess " made in the circumference of the piston, bucket, or plunger. " Those pistons of the piston block and cover which come in con-" tact with these rings are bevelled towards a point outside the " piston in a line with the middle thereof so as to fit the bevel of " the respective rings. A wedge-shaped metal spring of an " annular form is placed partly behind and between the bevelled " packing rings, and serves to keep them tight against the sides " of cylinder or pump barrel. Suitable stops are inserted for the " purpose of keeping the rings steam-tight at the parts where they " are cut through or split."

[Printed, 4d. No Drawings.]

A.D. 1861, March 9.—N° 592.

BARLOW, HENRY BERNOULLI. — (*A communication from Charles Voelckner.*)—(*Provisional protection only.*)—This invention of apparatus for preventing the explosion of steam boilers, consists of a standard bolted to the boiler, and a cast-iron pipe which descends funnel shaped into the boiler, below the water level; connected to the top of the cast-iron pipe, is a copper pipe, the upper end of which is closed with a plug and a bridle bar, whereto by levers and rods, the valve of a whistle is attached. So long as the lower end of the cast-iron pipe is below the water level, the steam pressure in the boiler fills the pipe with water, which sinks out whenever the water level falls below; steam then rushes up into the copper pipe, which immediately expands with increase of temperature, thereby raising the valve, which will cause the escaping steam to sound the whistle. The apparatus may be made to register the number of times when water has been

below its working level; it may also be made to show a signal light, shut the chimney damper, and quench the fire by turning water thereon.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 9.—N° 593.

JACOB, Joseph.—(*A communication from Carl Preisenhammer and Carl Weniger.*)—This invention relates to a mode and apparatus for obtaining hydrogen gas, and to its application for domestic, manufacturing, and other purposes. In order to produce the gas in large quantities at a comparatively small cost, steam generated in a steam boiler is caused to pass through a series of retorts each containing, heated to a red heat, a requisite quantity of particles of iron in the shape of turnings, borings, filings, or the metal otherwise granulated or broken up, so that a large metallic surface is presented to be acted upon by the steam. By these means the steam is decomposed and the hydrogen liberated, which is conveyed through suitable pipes to a receiver, where it is stored for use. Each retort may act separately, and be placed in communication with a receiver common to all. When by the absorption of oxygen the metallic particles become oxydised to a certain extent, the retorts are emptied and recharged with fresh metal, after the manner of discharging and recharging with coal for the production of gas for illuminating purposes. The gas contained in the receiver may be used in its pure state or mixed with air under atmospheric pressure. It may be employed for heating, warming, cooking, and other domestic purposes, also for heating stationary and marine steam boilers, for smelting and metallurgical operations, in the manufacture of glass, and other processes requiring intense heat. The gas and the atmosphere, each under pressure, are conveyed in separate pipes to the burners, where they unite and burn. The necessary proportion of each is determined by the size of the burners, ordinarily two parts of gas to five parts of air, both under pressure, is found to give a good result. Oxygen gas alone or combined with air may be burnt with the hydrogen gas. For illuminating purposes the compressed hydrogen gas and air combined and brought into contact with a solid body such as chalk will give a brilliant light.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 13.—N° 614.

FARREN, JAMES.—(*Provisional protection only.*)—This invention for preventing incrustation in steam boilers, constructing tanks for feed water, and material for furnace bars, consists in feeding boilers with rain or distilled water, which is to be stored in tanks of sufficient capacity to meet the requirements of continued dry weather; such tanks to be, by preference, constructed of non-absorbent bricks, united by hydraulic or water resisting cement. Furnace bars are made of fire-clay alone, or mixed with clinkers, broken pottery ware, ground or pounded with potters sand, glazed or unglazed.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 13.—N° 616.

GRUNDY, BENJAMIN, and ANDREW, SAMUEL.—(*Provisional protection only.*)—This invention relates to lubricating apparatus, " chiefly applicable to steam engines for lubricating the piston " rods, pistons, and cylinders thereof, but it may be applied to " lubricate shafts and other portions of machinery. The apparatus consists of a glass or other vessel containing the tallow or " other lubricating material; this vessel fits on a socket in which " is a hole, through which the lubricating material passes to the " piston rod or other article to be lubricated, and the orifice of " this hole can be varied by means of a moveable piston or " plunger, which is changed according to the quantity of lubricating material required. When this improved apparatus is " applied to lubricate the piston rod, piston, and cylinder of a " steam engine, it is attached to the stuffing box or otherwise in " such a manner that the lubricating material drops on the piston " rod near the stuffing box." Steam is admitted to the vessels containing the lubricant, " for the purpose of keeping it liquid."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 15.—N° 644.

COLLINS, WILLIAM.—(*Provisional protection only.*)—This invention relates to water, steam, and mercury gauges, for the prevention of accidents when the glasses or tubes of such gauges break. To the ordinary water gauge of a steam boiler a valve is applied above and another below the glass tube, each having a

"button or flange rather less in dimension than the opening of "the valve seating into which it enters, the spindle of each valve "is limited in its action by shoulders. When the gauge is at "work, and the glass is whole, the steam and water hold the "valves open to admit steam and water to the tube, but the "moment the glass breaks, either by accident or otherwise, the "steam and water acting on the buttons or flanges above referred "to, close the valves and prevent the escape of the steam and "water, thereby preventing the accidents that usually occur by "the blowing off of the steam and water. The action is the same "when the Invention is applied to a mercury gauge."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 15.—N° 659.

PENN, Joseph.—(*Provisional protection only*.)—This invention, relating to whistles or water indicators for steam boilers, consists "in attaching to the ordinary float of a boiler, by means of a "swivel and links, or in any other suitable way, a tube perforated "at one point in its length. This tube passes through the crown "of the boiler, and at the upper end of the tube the lower part of "an alarum or whistle is screwed to it. The upper or bell half "of the alarum is suspended above the lower part by a chain "passing over a pulley, and weighted at the opposite end with a "balance ball. The pulley is supported by an upright or carrier "on the boiler, or a lever may be employed for the same purpose. "As the water falls in the boiler, the float falling also draws "down the whistle tube until the holes in the tube dropping "under the crown of the boiler steam rushes through them into "the tube, and thus gives the alarm."

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 18.—N° 676.

ARROWSMITH, John.—(*Provisional protection only*.)—This invention relates to street and common road railways, and to engines and carriages for the same. It consists in fixing a rack to the side of one or both the rails or midway between them; also, placing an engine with six-inch cylinders and two foot stroke under the longitudinal seats of the first carriage. The connecting rods are coupled to a double crank shaft, whereon at each end a friction disc is fixed, to work into grooves formed inside the

driving wheels, which are six feet in diameter. A plate toothed wheel which takes into the rail racks is fitted to the inner face of each driving wheel, or on the centre of the crank shaft when the rack is disposed between the rails. When the engine cylinders are placed on the outsides of the carriages, and made to work on to crank pins fixed in the driving wheels, there are two connecting rods to each cylinder, one attached to the driving wheels and the other to the trailing wheels, the axles of which work through movable bushes. High-pressure steam is used and expanded to the pressure of the atmosphere to prevent noise. Tubular boilers of small diameter are fixed under the seats of the second carriage and between the engines under the first carriage. The funnel is horizontally placed between the boilers, and a draught is created therein by means of a small fan. For turning sharp curves the axles are in two parts suitably coupled, so that one wheel may revolve without regard to the speed of the other. The brakes are made to act on the rails; the engines, as far as practicable, are made of steel, and the carriage bodies of steel plates, stiffened where necessary.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 19.—N° 686

WALL, Arthur.—This invention, for preventing corrosion on boiler tubes, consists in placing within the furnace ends of tubes a short length of tube to protect the ends of the main tubes from corrosion; these protective tubes, which are about six inches long as a useful length, may be provided with flanges or lips to cover or lap over the extreme ends of the main tubes. By electrotyping or other process they, as well as the main tubes or plates, are to be wholly or in part covered with a suitable anti-corrosive metallic compound. The following composition and mode of applying it is preferred:—Pulverized asbestos or other magnesian earth saturated with sulphuric acid, to which is added a small quantity of water, the whole to be boiled in a pot over the fire until the moisture has nearly evaporated and the mass is nearly dry. When cool the metallic compound is added in the form of a powdered oxide or combined with an acid, in the proportion of from four to eight ounces of the metals to a pound of the prepared composition. The mass is then reduced to the consistency of a paint or wash by stirring into it a sufficient quantity of spirits of wine, naphtha, or

other spirit, to which a vegetable acid may be added. The application to the surfaces to be treated is performed by dipping, brushing on, or other ordinary mode of applying paints or washes. In order to protect the metallic coating from the scratchings of unconsumed fuel, a thin metallic grating is placed in front of the tube plate.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 19.—N° 690.

HAWKSLEY, George William, and WILD, Matthew.—This invention relates to so constructing the parts of steam boilers that lateral strength is increased with liberty for expansion and contraction; it is shown as applied to Cornish, breeches, and other boilers and furnaces, and consists in varying the diameters of alternate transverse sections of the flues, furnaces, and, if desirable, the shells which in ordinary boilers consist of a series of short cylinders of the same diameter united by rivetting. The alternate sections of the new boiler are plain short cylindrical shells, in length about the width of a boiler plate; the intermediate sections are of considerably less diameter, their ends are flanged round outwards at right angles and turned down to enter the ends of the alternate shells. Instead of flanging the small cylinders, the difference of diameter may be made up of single or double angle-iron rings rivetted together and round the cylinder ends, or the large internal shells may be flanged inwards to meet an outward flanging of the intermediates. Tubes for boilers are bent into a waved form, or twisted to an elongated open spiral.

[Printed, 10*d*. Drawing.]

A.D. 1861, March 21.—N° 711.

RHODES, Joseph.—(*Provisional protection only.*)—This invention relates to means and apparatus for generating steam in connection with an ordinary boiler; it consists in placing a continuous coil of pipe around the furnace and within the flues, gradually ascending from the bottom of the boiler with which one end of the coil communicates, through the flues to the upper part of the boiler to which the other end of the coil is attached; the coil is made in separate divisions to suit the various parts of the furnace and flues in which it is disposed; these separate divisions are jointed or united, so as to form one continuous channel from the

end attached to the lower part of the boiler to the upper end, so that a free circulation of water may be established therethrough.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 22.—N° 723.

ARMOUR, John.—(*Provisional protection only.*)—This invention, relating to steam boilers, consists in loosely placing blocks or bodies in the water spaces thereof, for the purpose of displacing a large amount of water, in order that the water level shall be maintained by the reduced quantity, which can then be brought to a boil in much less than the ordinary time, steam being subsequently generated more rapidly, and fuel saved. These bodies may be of any shape, size, or substance, indented or otherwise, and of such non-absorbent materials as will displace water; bodies of hard burned or glazed fire-clay preferred, having radiating projections and rugged surfaces, so that they may rest only on small points or surfaces in order that they may not exclude the water from the heating surfaces of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 22.—N° 724.

HUMPHRYS, Edward.—This invention relates to steam engines constructed on Woolf's compound high and low-pressure system as regards the disposition of the cylinders, in order to render them available for driving screw-propellers. The cylinders are horizontally placed on the plane of the propeller shaft at right angles therewith; the large condensing cylinder cover being sufficiently far off to allow the crank and connecting rod coupling to revolve; the small high-pressure cylinder is concentrically fixed to the bottom of the condensing cylinder, the two pistons being united by one central rod; the low-pressure piston gives off the united power of both cylinders, by means of two piston rods which work through stuffing boxes in the cylinder cover above and below the centre of the propeller shaft; the ends of the piston rods are attached to a T crosshead on the other side; one end of the connecting rod is jointed to a block attached to the end of the stem of the crosshead, the other end is coupled to the crank pin.

[Printed, 10*d*. Drawing.]

A.D. 1861, March 26.—N° 755.

SPENCER, HENRY, and TAYLOR, EDMUND.—(*Provisional protection only.*)—This invention relates to steam engines and boilers; consists (1), in constructing grate bars in the form of an arch, so as to raise the centre of the fire when the burning fuel is surrounded by water space, and in inverting such form in order to give a concave surface to the fire when the water space is above the furnace. 2. Relates to placing "barriers" of metal or fire-clay of a circular or other suitable form in or near the centre of the flues of steam boilers, for the more effectual distribution of the hot draughts over the surface of the flue plates; also placing metal vessels covered with composition or fire-clay within the flues of boilers for heating the feed water. 3. Attaching an oil vessel to locomotive engines in such manner, that by the aid of a lever or apparatus, the engineer shall be able when the steam is shut off, and the piston in motion, to cause the oil to flow out of such vessel through tubes towards the cylinder and piston, and lubricate the same.

4. Fixing a stand or spring for the engineer to stand upon while the engine is running, such stand or spring when the engineer's weight is removed either intentionally or by accident, shall "operate on the stoppage motion and shut off the steam;" also in case the rails or points be out of place, or other danger on the line, so fixing bells, levers, springs, or catches to the engine that they may come in contact with suitable apparatus fixed on the permanent way, and thereby give timely warning to the engineer.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 26.—N° 759.

DAVISON, THOMAS, and PATERSON, ROBERT.—This invention relates to surface condensing, and arrangements for working parts of steam engines; it consists (1), in spirally twisting, corrugating, or bending the tubes of surface condensers, or forming spiral indentations along such tubes, for the purpose of deflecting, disturbing, and preventing a direct flow of water therethrough or around them, in order that by constantly changing the course of the condensing water, its effect on the surfaces may be uniform. (2.) The simultaneous cleaning the insides of a number of the tubes of surface condensers, by a corresponding number of rods, fixed to *project from a frame* in position to enter the tube ends; a *sliding guide plate* upon the rods, supports and directs their loose

ends when entering the tubes. (3.) Cleaning the tubes of surface condensers externally, by means of a plate which is perforated to correspond with the position of the tubes; the perforated plate remains on the tubes between the tube plates, and when required to operate is made to slide along, and scrape from the surface of the tubes all accumulations requiring removal.

The invention also consists in placing the air and circulating pumps of inverted cylinder screw-propeller condensing engines, horizontally below the level of the condenser, on one side of the crank shaft, wherefrom they are worked by means of excentrics fixed to the crank arms; the coupling clip blocks are fitted to slide vertically within rectangular frames to which the pump rods are attached; the bilge and feed pumps are worked from the opposite side of the frames. In the case of oscillating engines, the air and circulating pumps are worked by the vibrations of the cylinders; they are fitted with trunk pistons, actuated by connecting rods jointed to brackets fixed on the cylinders. A supplementary pump worked by auxiliary power, is arranged for operating the valves of the main pump, in order to keep up the action of the condenser after the main engine has ceased working. Arranging the tubes of surface condensers in horizontal position in connection with inverted cylinder engines, and forming an air chamber in the head of the condenser, to act as a cushion for relieving shocks produced by the action of the circulating pump.

[Printed, 10*d*. Drawing.]

A.D. 1861, March 28.—Nº 770.

CHEVILLARD, François.—This invention relates to "machines "worked by concentrated power;" it consists in so placing one or more motive wheels in proximity to the boiler, that the velocity or impulsive force of a jet or jets of steam directed obliquely against lateral openings in the sides of such motive wheels, shall cause them to rotate; in one arrangement, the steam enters through the side openings into chambers within the motive wheels, and passes out at the periphery in a contrary direction against the atmosphere leading towards the chimney; in the other arrangement the steam acts direct on the surfaces of serrations formed in the periphery of the motive wheel, such surfaces coming up successively at right angles to the direction of the jets of steam, so as to receive its full impulse.

[Printed, 6*d*. Drawing.]

A.D. 1861, March 28.—N° 772.

BREMNER, JAMES.—This invention relates to steam boilers.—One with two flues is described; the ends of the boiler are flat, curving inwards towards the top, the sides bilge from about the level of the fire-bars to the top of the boiler almost to a circular form; an inner casing all round the sides and ends forms surrounding water space; opening to and extending from end to end there is a central chamber partaking of the same form as the internal space, but so much smaller as to leave flues of a regular width along each side; this central chamber is united to and communicates with the sides of the boiler by a series of water tubes which are disposed across the flues; the two furnaces are divided by a hollow metal bridge through which the feed water passes before entering the boiler; placed along the top of the bridge there is a pipe for supplying air to the furnaces to assist combustion. The fires are fed alternately, so that the fierce heat arising from the incandescent fuel on one, shall consume the smoke and heavy gases arising from fresh feeding the other; the flames and gases mix over the furnaces and rise up the side flues, passing between and lapping over the surface of the water tubes, above which the hot draught serves to superheat the steam in the upper part of the boiler by contact with the plates enclosing the steam spaces, afterwards passing out of the crown of the boiler to the chimney, wherein it is proposed to arrange a series of superheating tubes. The boiler is furnished with the usual fittings and appliances.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, March 28.—N° 779.

STRATFORD, WILLIAM.—This invention relates to the construction of the sides and bridges of furnaces of wrought-iron formed into hollow chambers suitably stayed, through which the feed water passes and is heated before entering the boiler; these chambers communicate by pipes with the water and steam spaces of the boiler. Furnaces for bakers' ovens, brewers' coppers, and for other boiling and heating purposes are so constructed; pipes are provided for carrying off steam to the chimney, and the supply of water is regulated by a float; thin or narrow passages are arranged between and about the water chamber for the introduction of air, which is made to combine with the flaming gases

at the back of the furnace. The invention does not relate to furnaces contained within steam or other boilers.

[Printed, 10*d*. Drawing.]

A.D. 1861, March 30.—N° 785.

SYKES, Thomas, and SYKES, Benjamin Clifford.—This invention relates to "steam boilers, and the prevention of incrus- "tation therein," and consists :—1. In so placing partitions in steam boilers that the circulation of the water shall be increased thereby. As an example in double flued boilers with two furnaces an upright longitudinal partition between the flues is set upon a horizontal partition below the furnaces; and in single flued and other boilers the partitions are so disposed that the upward course of the currents is interrupted and made to circulate through and over the remote parts of the water space, for the purpose of disturbing and preventing the settlement of those deposits which form incrustation. 2. The so arranging the water pipes which feed a series of steam boilers that the second boiler shall be fed from the first, the third from the second, the fourth from the third, and so on through the whole series, the water being made to circulate in each in succession, and after circulating through the last be made to impart the heat it contains to the feed water, "as de- "scribed in the Specification of a Patent granted to the aforesaid "Thomas Sykes, Benjamin Clifford Sykes, and to James William "Crossley, N° 732, A.D. 1860." 3. Separating by filtration all organic or other matters from the blow-off or outflow of impure or turbid water from steam boilers, and returning the same as pure feed water whilst in its heated state. Instead of pumping the filtered water back into the boiler it may be made to flow therein by the force of its own gravity assisted by the pressure of steam.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, March 30.—N° 786.

CASS, John.—This invention relates to various arrangements and disposition of the parts of steam engines, regulating steam pressure, governors, lubricating pistons and cylinders, cut-off valves, condensers, boilers, grate bars, safety valves, working feed pump, heating feed water, and a syphon box.

Four or more direct acting high or low-pressure vertical cylinders, or high and low-pressure cylinders combined, are so arranged to work on to one or more crank shafts that no two throws are turning their dead centres at the same time; the steam, either high or low-pressure, to be worked successively through the whole number of cylinders when required, but when working high and low-pressure combined to exhaust from the high into the low-pressure cylinders in such time and manner as to keep up a uniform motion in the gearing. Air pumps, when required, to be placed under the cylinders and worked by the piston rod through the cylinder bottom; or two air pumps may be worked from the crosshead of one cylinder; the cold and hot water pumps are also worked from the crossheads; no packing stage is required for the cylinders. Double beam engines with two vertical low-pressure cylinders are combined with a horizontal cylinder placed between them, and working direct, either high or low pressure, on the same crank pin, or otherwise when required; both beams work on one centre. Other arrangements and positions of working parts are described. Exhausting high-pressure steam from compound engines into a detached cylinder wherein a metallic piston is balanced, to maintain a uniform working pressure of the steam it receives from high-pressure cylinders and supplies to low-pressure cylinders. Giving motion to the governor of an engine or machine by means of a turbine or "Barker's mill," through which the condensing stream of injection water is made to pass; and constructing governors with three or more balls connected to the sliding sleeve for working cut-off valves and regulating speed. For lubricating pistons and cylinders a groove is formed round the face of the upper piston ring, and one on its top side; these two grooves communicate with each other by means of a series of small holes; oil is supplied through a tube in connection with an oil cup in the cylinder cover. A ring of gasket placed between the piston rings is also supplied with oil in the same manner, or from an annular groove in the cover. Steam is worked expansively by the use of separate cut-off valves worked by sliding cams or tappets actuated by the governor. Increasing the size of condensers, and introducing in one part a number of tubes, through which water from the hot water pump is forced on its passage to the boiler; a compartment is arranged for collecting the water of condensation. In arranging and constructing such boilers as are fired underneath from the front end,

the flaming gases pass along under the boiler, rising and entering fire tubes at the back, coursing through to the smoke box in front and dividing into the side draughts; small fires are placed in the side flues. Cylindrical boilers fired underneath, or at one or both ends of internal flues, contain tubes between the flues and shell, and are connected with a water heating apparatus in the flues; this boiler is set on hollow brackets, to which the blow off pipes are connected. Another cylindrical single-flued boiler and a horse-shoe boiler are described in connection with heating apparatus. The sides of grate bars are serrated, so that when moved they may break clinkers; their tops are bevelled, fluted or plain; backward and forward motion is given to them by a shaft or lever; their ends rest on inclined bearers or rollers, which cause them to rise and fall. Other grate bars are described, including wrought-iron hollow tubes, through which the water circulates. Dividing the box or cover containing the safety valve into two compartments, and placing a spiral or plate spring in the upper section to weight the valve, which is unloaded by a lever or weight in connection with the valve spindle. Placing a fan in the back flue of a boiler, to be actuated by the chimney draught, for working feed pumps or for other purposes. Heating feed water in a series of tubes or pipes connected to water cisterns and disposed in the take-up, the back end, or side or back flues of boilers; or so connected to feed water vessels, that their ends shall project into the fire flues and hot draughts. Pipes for heating water are disposed in various other ways within the boiler flues; also a water heating apparatus composed of tubes, is made to revolve within the flues exposed to the burning current. A self-discharging syphon box is placed on springs to receive condensed water from steam pipes, cylinders or vessels; the accumulating weight of water by depressing the springs, causes a valve at the bottom of the box to be opened by its spindle coming in contact with a projecting bar, when the discharge takes place.

[Printed, 12*s*. Drawings.]

A.D. 1861, April 1.—N° 807.

BROOKES, William.—(*A communication from James Martin.*) —This invention relates to superheating steam by the waste gases of combustion. The apparatus shown as applied to a locomotive engine, consists of two cylindrical superheating vessels fitted

with a number of longitudinal tubes, which form passages for the products of combustion; these superheaters are disposed slightly inclining from a vertical position on each side of the blast pipe within the smoke chamber near to the ends of the boiler tubes; they are provided with covers, which are fashioned to form passages for leading the hot draughts from the superheaters to an open annular chamber internally formed round the base of the chimney. The steam on its passage from the boiler to the cylinders passes through the superheating chambers; after each exhaust blast up the central opening a partial vacuum exists within the surrounding annular chamber, which has the advantageous effect of drawing the hot draughts through the superheaters from the lower ranges of boiler tubes, whereby they are cleared from material deposits.

[Printed, 1*s*. Drawings.]

A.D. 1861, April 4.—N° 834.

BENSON, Martin.—This invention relating to steam generators and apparatus connected therewith, consists of supplementary improvements to steam boilers described in the specification of a patent granted to this inventor, bearing date 21st August 1858, N° 1903.

The improvements are applicable to those steam generators where the water forced from a receiver by mechanical means, is made to circulate through a series of tubes closely arranged or packed in horizontal sections or otherwise within a chamber heated by a furnace beneath. To form the return courses through the tubes, their ends are united by short bends fitted to receive the ends of the tubes, which are forced into them by means of a drawing bolt. The ends of the lower series of tubes are all connected to a horizontal pipe, supplied by a pump with feed water from the receiver, whence the current passes in close serpentine course upward through each succeeding series of tubes constituting the generator to the water level tubes in the series, the ends of which open into, and are connected to a longitudinal pipe, which is divided into two compartments by a horizontal partition; thence the steam generated passes through an upper series of similar tubes, where it is superheated; the water flows back to the receiver *for re-circulation*. The bends on the ends of the

tubes are protected from the flaming gases by side plates. The space below the fire bars is open to the atmosphere.

[Printed, 1s. 10d. Drawings.]

A.D. 1861, April 8.—N° 862.

BLAKE, Henry Wollaston.—This invention relates to coining machinery and to a valve for regulating the expansion of fluids applicable to steam and other engines. It consists, (1) in applying the pressure of the atmosphere for giving motion to the screw coining press by adapting slide valves to the vacuum cylinder, in lieu of the ordinary valve and gearing, and applying to these slide valves an adjusting screw with separate slide valve for controlling the passage of air through the apertures, whereby the force of the blow by the downward stroke of the piston and the force of the recoil are regulated. 2. Giving motion to the feeder by means of a lever on a vertical spindle actuated by another lever attached to the screw, whereby the stroke is constant whilst the stroke of the press is varied. 3. Feeding the blanks to milling machines by inserting at intervals into the central disc pieces of leather or other material, which by frictional contact cause the blanks to descend into the milling groove. 4. Applying in addition to the ordinary slide or other valve a rotating expansion valve to the cylinder of a steam or other engine or machine, which valve consists of two longitudinally slotted cylinders fitted within a cylindrical casing which opens to the slide valve; one cylinder is constantly revolving within the other, the position of the slots in the outer cylinder, with regard to the opening from the casing to the slide valve, being regulated so as to increase or diminish the area of the steam passage by a set lever arm; the steam enters at the end of the inner cylinder and passes through the two cylinders when the slots during the revolutions of the inner cylinder coincide, the amount of steam actually discharged being regulated by the position of the slots in the outer cylinder in relation to the steam passage out of the casing in communication with the slide valve.

[Printed, 1s. 4d. Drawings.]

A.D. 1861, April 9.—N° 870.

PHILLIPS, William Henry.—This invention relates to *supporting the combustion* of fuel for generating steam and other

purposes by the use of steam, or steam combined with atmospheric air. The furnaces of boilers may be enclosed in fire-brick work or surrounded with double metal casing forming water space. Two of such furnaces connected to tubular boilers are described, but the invention is general in its adaptation to all furnaces. Built within the walls surrounding the brick furnace there is a narrow metal casing or steam chamber, which communicates with the furnace and ash-pit by means of numerous short tubes, and with the steam space of the boiler by means of a pipe. The fuel is supplied through the crown of the furnace from a hopper above. The metal furnace is supplied from a hopper in front. The ash-pits of both furnaces are closed by dampers, over which the burning fuel is supported on perforated fire-clay beds by bars or perforated plates. The boiler attached to the metal furnace is arranged to superheat the steam after it leaves the steam space. The steam, by means of a pipe, is brought from the superheating chamber at the back of the boiler to the ash-pit, whence it finds its way to the burning fuel through the perforated fire-clay bed. To the fire in the brick furnace the steam is brought direct from the steam space to the narrow chamber, and thence into the ash-pit and furnace through the short tubes. When the fires are first lighted air is admitted to the ash-pits, which are closed so soon as the steam pressure is sufficient to force a draught. Atmospheric air is sometimes admitted at certain points of the circuit into the flues to combine with and re-ignite the gases, which "are composed chiefly of hydrogen gas, carburetted hydro-"gen, and carbonic oxide," whereby a large amount of additional heat may be derived.

[Printed, 10*d*. Drawing.]

A.D. 1861, April 10.—N° 880.

LAMB, ANDREW.—(*Provisional protection only.*)—This invention relates to supplying marine surface condensers with sea water. 1. Gratings are attached fore and aft of the engine to the ship's side; an inlet pipe from the forward grating conveys the water to the condenser, whence, after circulating therein, an outlet pipe conducts it to the after grating, the water current being established therethrough so soon as the vessel is under way; in screw vessels a lip may be *attached to the* after grating for directing the water *towards the draught of* the propeller, in order to increase the

speed of the water through the pipes. 2. Conveying surplus steam from safety valves or when otherwise blown off or escaping from boilers, through pipes with cocks and valves directly connected to the condensers, without passing it through the engine. 3. Using the ordinary surface condensing circulating pump in case of fire, to throw water on the deck, or of leakage to raise it from the bilge.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 11.—Nº 890.

BURY, William.—This invention relating to steam engines and boilers consists in applying valve boxes to two sides of each cylinder, in which two main slide valves with alternating movements are worked by means of a grooved cam on the crank shaft; the grooves form eccentric paths for rollers, which are mounted upon studs fixed in the ends of two levers that communicate motion to the slide valves, thereby alternately opening the steam ports to the piston and exhausting on the opposite side. For marine purposes, by preference, two pairs of cylinders are divided and mounted on the condensers on each side of the crank shaft about 10° above the centre, the piston rods inclining thereto; the connecting rods of each pair work on to the same crank pin. The air pumps are contained within the condensers. The opposite cylinders and condensers are connected together by four side frames which carry the main shaft. Arrangements are made for reversing. The boiler is shown as tubular with three furnaces; the furnaces and smoke chambers are divided by thin hollow partitions and partially lined to form hollow spaces wherein the steam is superheated as it passes from the steam space in the boiler to the steam pipe of the engine; where necessary, the plates forming the thin steam passages and hollow linings are protected from extreme heat by fire-brick guards or shield plates.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, April 11.—Nº 898.

ROBERTS, Samuel.—This invention relates to steam engines, and generators to be used therewith, whereby ordinary steam boilers may be dispensed with. An ordinary furnace may be employed, and supplied with air from a blast pipe; surrounding the chimney there is a casing containing water. The external dia-

meter of the tubes which form the heating or generating apparatus is $1\frac{1}{2}$ inch through their whole length, but the internal diameter diminishes from 1 inch at the top to $\frac{1}{8}$th of an inch at their lower ends, which are screwed into a "heat box," placed immediately over the fire and exposed to the fiercest heat. The ash-pit can be closed, and the air necessary to support combustion supplied "by a fan or "bellows blast." The number of tubes will vary according to the power required; and in form they may be either straight, spiral, ziz-zag, or otherwise. They are entirely filled with water, which is admitted to the cylinder in regulated quantities by a double system of slide valves, at a temperature of 600° Fah^t. and upwards; slight expansion takes place during the passage through the valves, but the moment the highly heated water gains admission to the cylinder, it instantaneously flashes into steam, the heat box and tube ends being constantly maintained at red heat. The feed water is supplied to the heat box from the chimney casing by means of a donkey engine and force pump. The valves are worked by a bell-crank lever, actuated by a double cam on the crank shaft.

[Printed, 10*d*. Drawing.]

A.D. 1861, April 16.—N° 928. (* *)

RIDGE, SAMUEL.—"Improvements in apparatus applicable to "steam boilers and steam engines."

This invention consists :—

"First, in certain improvements in the construction and "arrangement of apparatus for indicating the level of the water "in steam boilers.

"Secondly, in an improved mode of constructing valves for "steam and water.

"Thirdly, in an improved metallic packing for pistons, pump "buckets, and stuffing boxes.

"And, lastly, in an improved lubricator for the piston rods "and valve rods of steam engines."

1. The glass tubes of water gauges are fixed in a fluted column, to which side pipes are cast for attaching the gauge to the boiler; each pipe being provided with a valve made of a conical annular hard metal plug acting against a seating of copper or other soft metal. The glass tube is held in the column, which is closed below by a nut at the top, through which is inserted the end of a *pipe for carrying off steam* and water when requisite. 2. The

same construction of valve may be substituted "for the ordinary "mud cock." 3. The packing consists of three rings, the centre one having two conical surfaces, against which the conical surfaces of the other two act; one of the latter is wedge-shaped in section, and the apex of the third ring fits between one side of the double cone and the end of the second ring. 4. The lubricating material is placed in a vessel near to the rod to be lubricated, and a small portion of the lubricating material is allowed to escape through a valve by means of the crosshead or other projection on the rod acting on a lever connected to the valve.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, April 17.—N° 941.

VICKERMAN, Joseph.—This invention relates to syphons for carrying off condensed water from steam pipes without loss of steam. A rectangular cast-iron box, with sides tapering downwards, forms the syphon casing; the lid, in which there is a small valve for the emission or admission of air, is bolted on and made steam-tight by india-rubber packing; a screen of metal plate, which extends downwards near to the bottom of the box, shuts off communication between the inlet pipe in the side of the box and the interior, excepting under the lower edge of the screen; the outlet pipe is centrally fixed to the bottom of the box, into which a metal socket which stands above the bottom is screwed from the inside; a large ball float is supported in the centre of the box by a hollow stem or tube, which works vertically up and down in the socket when the ball rises and falls; this stem tube is perforated with small holes near the top; an inverted cup attached to a regulating screw in the centre of the cover, checks the rising of the ball beyond a proper height; steam is excluded from the box when the water is level with the top of the socket, it being then above the bottom of the screen. As the water accumulates within the box, it lifts the ball float off the top of the socket, and so soon as the perforations in the stem tube rise above that level, the water discharges therethrough down the tube into the outlet pipe without any escape of steam.

[Printed, 8*d*. Drawing.]

A.D. 1861, April 19.—N° 961.

EAVES, Arthur Frederick.—(*Provisional protection only*.)—*This invention* relates to the manufacture of bezels or rings used

amongst other things for containing or encircling the glass coverings which enclose the dial faces of clocks, barometers, steam gauges, and such like articles. A strip of metal is first formed into a hoop or ring by bending until its two ends meet, which are then soldered or brazed together. It is then placed in a lathe chuck which is slightly conical, and by pressure with an ordinary pressing tool while the lathe revolves the hoop is made conical; it is then placed in another chuck, which by means of pressure with a suitable tool as before forms a rim round the outer edge; another chuck in conjunction with another pressing tool operates upon the inner part of the hoop, in which an annular groove is afterwards turned to receive the glass, which is sprung into it. The hinge and peg are attached to the bezel afterwards in the ordinary manner.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 19.—Nº 966.

RIDLEY, John.—This invention relates to generating and superheating steam, and consists: 1. In generating steam by any ordinary known means, and passing such steam through a valve into a superheating apparatus; the valve is for the purpose of preventing the steam reacting upon the boiler after it has been superheated; water is forced into the superheater at the time when the steam enters, which together supply sufficient steam for one stroke of the piston without exhausting the apparatus. 2. An arrangement of two close spiral coils of superheating pipes within a circular furnace chamber, disposed so as to form the inner and outer walls of an annular furnace, which is fed from a hopper above, wherefrom the fuel is distributed upon the circular fire by a suitably formed conical shoot; above the fuel the convolutions of the coils are gradually contracted, so as to form a double spiral cone; the furnace chamber is placed concentric within a vertical cylindrical boiler shell, which surrounds the chamber with water space; an annular flue, opening to the chimney flue, surrounds the top of the boiler shell; fire tubes, tapering upwards, form a passage for the products of combustion through the upper water and steam spaces of the boiler, from the furnace chamber to the annular flue above; the spiral furnace coils terminate in a valve outside the boiler, wherethrough, regulated by excentrics, steam and water are supplied from the upper spaces in the boiler to the

superheating coils, the extreme lower ends of which terminate in a valve which regulates the emission of steam to the engine cylinder, or to other required purposes.

[Printed, 6*d*. Drawing.]

A.D. 1861, April 19.—N° 972. (* *)

ᵀOBSON, JOHN.—(*Provisional protection only.*)—Improvements in boiler furnaces. The fire-bars are made in two portions, hinged at the centre and capable of folding downwards at each side; behind them are formed a second set of ordinary bars, which project backwards beyond the fire-place; both sets of bars are attached to a frame, so that they can be drawn forward, the hinged bars clear of the furnace, and the other bars to occupy their place in the furnace and support the fuel; the coal is placed on the hinged bars as they are folded down, and they are then pushed back and the fuel gradually raised by lifting the bars; the smoke passes through the hot coal above and is consumed.

[Printed, 6*d*. Drawing.]

A.D. 1861, April 19.—N° 975.

GJERS, JOHN.—(*Letters Patent void for want of Final Specification.*)—This invention relates to the construction of apparatus for obtaining motive power from air, elastic gases, or superheated steam, which consists of a cylinder containing a working piston. Fixed at each end of the cylinder is an air vessel; these vessels are closed to the atmosphere, but are respectively permanently open to the cylinder ends, and have no communication with each other. Through each air vessel there is a group of small copper heating tubes, the ends whereof are fixed in tube plates which form respectively two sides of each air vessel. Between the two vessels there is a furnace, the flue of which separates in two directions and meets afterwards in one common chimney. Each direction of the flue leads the flaming products of combustion through the tubes in one or other of the air vessels, and this is caused alternately to take place by means of a damper valve. The fire draught taking one direction passes through the tubes of one vessel, and by conduction heats the air contained therein, causing its expansion, which acts against and forces the piston to the opposite end of the cylinder, whilst the damper valve (by means of a tappet motion or otherwise) is suddenly reversed, whereby

the direction of the fire draught is changed and caused to course through the tubes in the other vessel, where, in the same manner, the air therein is expanded, which effects the backward stroke of the piston at the same time that the damper admits a cold current of air through the tubes just closed against the fire-draught, which produces a partial condensation of the air in that vessel whilst expansion is going on in the vessel at the other end. The same air is continued in the vessels, and it is by alternately heating and cooling this air in each vessel respectively that the reciprocating motions of the piston are obtained.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 20.—Nº 987.

HUDDART, George Augustus, and HUDDART, Joseph Durham Erskine.—This is an invention for converting the reciprocating motion of steam engines into direct rotation, without the aid of a fly wheel. The engine cylinder is mounted in the usual way, and is of the ordinary description, giving, by the alternate strokes of the piston rod, reciprocating action to the connecting rod, which is coupled to a crank arm on a first motion shaft; at a point on the connecting rod about one-third of its length from the piston joint, there is a fixed projecting stud, whereon a bowl is fitted free to revolve; this bowl traverses a fixed recessed endless path or groove, which forms an arc on each side of the centre line, where the ends meet; the lateral motion of the connecting rod is constrained by the bowl in its fixed path, and so acts as a fulcrum when the crank is turning the centres, that the latter is thrown forward it its revolution out of the direct line; the crank pin has liberty to move in a slot on the crank arm. Arrangements are made for reversing the motion of the engine.

[Printed, 8*d*. Drawing.]

A.D. 1861, April 22.—Nº 994.

DUGDALE, Anthony.—This invention, relating to centrifugal governors for steam engines, consists in giving to the sliding socket, whereto the links which connect the revolving arms are jointed, a suitable counterpoise weight, or, acting on the sliding socket or corresponding part of the governor by a suitable lever or arm, *or by springs or other* suitable contrivance, causing the *socket or corresponding* part of the governor to be a perfect

counterbalance or constant equipoise to the centrifugal force of the balls, the said sliding socket having by suitable connections the control of the throttle or slide valves for regulating the admission of steam to the engine.

[Printed, 6*d*. Drawing.]

A.D. 1861, April 25—N° 1029.

SCOTT, George.—This invention relating to steam engines and condensing steam, consists, (1) in making the trunnion bearings of oscillating cylinders hollow to form receptacles for the steam; passages through the trunnions in communication with each side of the piston are arranged to open and close with the motions of the cylinder; these passages are governed by cut off valves within the entrance to the trunnion bearings; they are actuated by an eccentric cam, or the motions of the cylinder, whereby the steam may be worked expansively; the direction of the steam is changed for reversing. 2. Consists in the particular construction of surface condensers formed by packing plates of copper, brass, or suitable metal, so as to form thin chambers wherethrough steam and condensing water take alternate separate courses, their directions being controlled by small square corrugated packing pieces of suitable metal; each steam chamber communicates with a receptacle for the water of condensation, whence it is returned again to the boiler. The apparatus is packed within suitable casings, and held together steam and water-tight by means of strong tie bolts. 3. Saturating highly superheated steam, by introducing into the steam pipe near the cylinder a jet or jets, drop or drops of water mixed with oil, tallow, or other lubricant in such proportions as may be required to protect the working surfaces from the extreme heat of the steam. 4. Consists in connecting tubes of boilers or condensers, by short bends, so as to form spiral or serpentine coils with a continuous passage through, the ends of the tubes being V-shaped to fit into corresponding recess-shaped grooves sunk round the ends of the bend, in which they are held by bolts.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, April 25.—N° 1044.

NEWTON, Alfred Vincent.—(*A communication from George Washington Rains.*)—(*Provisional protection only.*)

This invention for regulating the water level in steam boilers, consists in an apparatus capable of supplying water, and giving audible signals when the level is too high or too low. A cylinder is placed outside the boiler, communicating by separate pipes with the water and steam spaces, so that the same water level is established in both; the cylinder is fitted with a piston, which by suitable lifting mechanism connected with the piston rod, is raised and allowed to fall upon the water. The piston rod, which passes out at both ends of the cylinder, and the lifting apparatus, are so connected with the feed valve and alarum, that the regulating valve is either opened or closed according to the height of the water level, and the feed is regulated so long as the supply continues. In case of failure, an alarm is given in time to prevent injurious consequences.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 27.—N° 1064.

MILLER, Thomas William.—This invention relates to an arrangement of the cylinders and parts of compound marine engines. Two horizontal condensing cylinders are placed side by side at right angles to the main shaft, all the centres being on the same plane; there are two piston rods to each cylinder working through stuffing boxes in the cover of each, one above and the other below the crank shaft; each pair of rods are attached to a crosshead, from which their respective connecting rods reciprocate the power to the crank shaft; superposed on a centre line between the two condensing cylinders there is a small high-pressure cylinder, which works with a short stroke on to a counter crank shaft fixed above the main shaft; the two shafts communicate with each other by means of a pinion wheel on the counter shaft, which gears into a spur wheel on the main shaft, their relative speeds being two revolutions of the pinion to one of the spur wheel, or two strokes of the high-pressure cylinder to one stroke of each condensing cylinder, in order that by exhausting into them the high-pressure cylinder shall supply steam to both. The teeth of pinions are formed out of solid shafts by planing. Combining a feed water-heating apparatus with a surface condenser; the feed water and the condensing water pass in and out of separate *chambers, but the* steam passages communicate with *both; the exhaust steam* first passes into the chamber and tubes

of the water heater, and thence into a chamber at the bottom of the condenser, rising within the tubes, which are closed at their upper ends and open downwards therein: in some cases the tubes are bent to return again through the tube plate, both ends opening within the steam chamber below; mid-feathers of thin metal are placed in the tubes, to effect perfect circulation of the steam within. Ether is sometimes employed for condensing purposes; it is contained in a separate vessel filled with tubes, attached to the side of the condenser; a current of cold condensing water is kept up in the vessel between the tubes; the ether descends from the vessel through a passage to the bottom of the condenser, and surrounds the tubes therein; the heat from the steam within the tubes vaporizes the ether, which rises to the vessel, where it is condensed and cooled and again passes down the passage in a liquid state amongst the steam tubes, whence it rises again in a state of vapour, and so on constantly changing from vapour to fluid and vice versâ, the circulation being kept up by the descending fluid and the ascending vapour.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, April 29.—N° 1071.

MASH, James.—This invention, relating to steam engines, consists in combining the impulsive and expansive forces of steam to act within one cylinder upon three pistons. The cylinder is of the ordinary construction, with slide valve and steam box, and the induction and eduction of steam is effected alternately in the usual manner at each end of the cylinder, within which there are three pistons; viz., the central or main piston, fixed upon a central piston rod, and an auxiliary or jet piston acting above, and another below the main piston near to the cylinder ends; the main piston rod passes through an opening in the centre of each jet piston; these openings are closed by the steam pressure on annular valves when the induction takes place, which valves open to exhaust; the two jet pistons are fixed upon two rods in a line with the main piston rod; they pass through the main piston and out through stuffing boxes in the cylinder cover; both are attached to one crosshead, which has a central opening to admit therethrough the main piston rod, the stroke of which is considerably longer than the rods of the jet pistons, which, although differing therewith in speed, in the proportion of about 3 to 5, have simulta-

neous action. The outer faces of the jet pistons are perforated with a number of holes or steam jet channels tapering through to the inner face. When the induction enters, it operates on the face of a jet piston, which having only a short stroke moves slowly, whilst the steam, impelled by its full expansive force, flies through the perforations with great velocity, and enters the main piston chamber in numerous jets, which at first strike the piston face with that impulsive force which is due to the full weight of the steam pressure, until the accumulation of steam within the chamber checks the force of the jets, when the steam finishes the stroke by its expansive force alone.

The connecting rods work on to a triple crank shaft, the lengths of throw corresponding with the different lengths of the strokes of the pistons. In beam engines three beams are required, one on each side, loose upon the fulcrum pin of the main beam.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, May 1.—N° 1081.

HORN, WILLIAM.—(*A communication from Horatio Allen.*)—This invention relates to fixing tubes in plates so as to ensure steam or water-tight joints; it consists in the use of compressed wooden ferrules, for packings between the ends of the tubes and the holes in the tube plates, which are made larger than the tubes, so as to leave an annular space for the packing, which projects beyond the plate on each side; the natural swelling of the wood when steam or water is admitted forms a shoulder round the hole in the plate, and a perfectly steam or water-tight joint between it and the surface of the tube. When used to form dry vapour joints between tube ends and plates, the wood ferrules are saturated with oil or other similar matter to cause them to expand. The wood ferrules are first turned much thicker than the annular space they are intended to fill, and are afterwards compressed to the required size, by means of a mandrel and a die.

[Printed, 6*d*. Drawing.]

A.D. 1861, May 1.—No. 1085.

BRAMWELL, FREDERICK JOSEPH, and OWEN, WILLIAM.—This invention relates amongst other things to a mode of manufacturing rails, *bars, and plates*, in such manner as to avoid the *waste arising from cutting* off the ends, and the loss of time

and labour spent in returning the bar or plate over the top roller. An annular pile is made either by coiling iron round a mandrel, or by rings packed in and upon each other, or by other means; the pile is then heated to a welding heat and hammered into an annular bloom; if necessary it is reheated before being operated upon by rolling machines of varied construction, containing rollers and roller dies and revolving moulds, according with the required form and application of the articles produced; rails, rods, &c. receive their finished shape whilst ring formed, they are then cross cut on a radial line through the circumference, and whilst still heated are opened out to length upon a plane surface, the intended length being calculated by the circumference of the ring. Plates are first rolled into cylindrical rings or shells, the metal being so piled as to give the required quantity for equal and necessary distribution whilst under the operation of the rollers; thin plate shells are cross cut whilst in the rolling machine, whence they are delivered as a sheet or flat plate. For constructing steam boilers and vessels, the cylindrical plate shells are used for the annular sections; if required greater thickness of metal is given to the edges for rivetting them together by either lapped or butt joints. The hollow bottoms of vessels and other articles of iron ware are shaped by conical rollers of the necessary form; in some cases they are finished with a thick rim, which is grooved to receive the lower edge of a cylindrical shell; the edges of the groove are then closed round the edge of the shell, so as to make a water-tight joint without rivetting. Cast steel tires are hammered into moulds to reduce their width and consolidate the metal, and ordinary railway tires are made by placing an annular pile in a mould, where it is hammered and consolidated. Restoring worn rails and tires to their original transverse section, by longitudinal compression while heated, such rails being by the process reduced in length and the tires in diameter, suitable for smaller wheels. Supporting puddled steel balls sideways in a mould during hammering and squeezing, in order to prevent a fracture of the ball when subjected to the full force of those processes whilst at its greatest heat, and also to effect the cleansing and more perfect consolidation of the metal. Operating on blooms with hammer faces sufficiently large to cover the whole surface, such blooms *being laterally* supported in moulds during the process. Making *railway axles* by forming piles of groups of bars nearly the *required length*; such piles after their component parts are heated

and welded, by stamping, rolling, or hammering, are laid in a bottom swage or mould, when the top swage or mould actuated by a motor, by beating and hammering completes the process. Manufacturing crank axles with one or more throws, by forming the pile with a number of bars bent and packed to the required form, and finished in moulds by beating and hammering. When forging large masses in moulds, two hammers, one at each end of the mould acting simultaneously in opposite directions are employed, and when making hollow forgings, a mandrel is used capable of being moved through one or both of the hammer faces; two pistons acting within one cylinder actuate the hammers; they are attached to the piston rods, which work through stuffing boxes out of the top and bottom of the cylinder. Steam cylinders may be made to surround the mandrels, the hammer heads being carried by trunk piston rods sufficiently large to admit the mandrels. The other material parts of this Specification, which extends to 43 pages of letterpress besides 71 illustrations, relate to the description and details of the particular kind of machinery required to carry out the improved manufacture.

[Printed, 6s. 4d. Drawings.]

A.D. 1861, May 3.—N° 1118.

HUMPHRYS, Edward.—(*Provisional protection only.*)—This invention, relating to machinery for steam vessels, "has for its " object improvements in the application of hydraulic pressure on " board steam vessels, and consists" (1) "in applying a cylinder " fitted with a piston or plunger so arranged as to cause the " pressure of water or other fluid on the piston or plunger to " give motion to the valve gearing in order that the stopping and " starting of the engines of steam vessels may be effected by such " motion." 2. "The application of a cylinder fitted with a " piston or plunger so arranged as to cause the pressure of water " or other fluid on such piston or plunger to give motion to a " rope or chain, whereby the cargo of or coal for a steam vessel " may be hoisted in or out of such vessel; and" 3, "the appli- " cation of a cylinder fitted with a piston or plunger so arranged " as to cause the pressure of water or other fluid on such piston " or plunger to give motion to the chain cables of steam vessels, " so that their anchors may be raised by such motion, and the " *cables worked as required.*"

[Printed, 4d. No Drawings.]

A.D. 1861, May 4.—N° 1121.

RYDILL, George. — (*Provisional protection only.*) — This invention relates to condensing and consuming smoke; is applicable to locomotive engines, steam ships, furnaces, and other purposes; it consists in passing the smoke through a red hot retort of any convenient form, disposed in the furnace or flues, where, exposed to the action of the burning gases it can attain to the required heat; beyond the boiler or furnace and within the chimney flue, a fan is fixed for drawing the hot draughts through the retort and flues, and forcing them on to a reservoir, where the remaining products of combustion are discharged below the surface of water contained therein, to which in some cases, lime or liquids must be added, as the constituent parts of the residue of the gases will vary according to the quality of the coal. Purifying "water "or steam springers" may be fitted to act upon the products of combustion as they course along the flues.

[Printed, 4*d*. No Drawings.]

A.D. 1861, May 4.—N° 1125.

HOMERSHAM, William Collett.—This invention relates (1) to portable engines and implements for ploughing and cultivating, and consists with reference to engines, in forming water tanks within the travelling wheels of engines, by enclosing them with convex sheet metal discs on each side, flush at their edges with the face of the rim; the delivery of water takes place into a cistern conveniently placed, each revolution, through a scoop pipe within the wheel, which is in communication with the hollow axle.

2. Dividing the boiler into separate sections, by placing transversely therein a number of vertical partitions extending from the bottom to near the top, to prevent whilst ascending or descending inclines, the body of water from flowing to one or other end of the boiler, and to keep it as much as possible in equal distribution through the whole length whilst the boiler is on a slope; when on level ground the separate sections communicate by means of valves. To economize heat, the feed water is introduced at that end of the boiler which is farthest from the fire.

3. Working ropes or chains covered with metal beads upon V grooved pulleys, for transmitting motion from the crank shaft

to the pinion shaft which drives the travelling wheels; also grooved pulleys fitted with sliding self-acting clips, which are made to grip and release the rope at suitable points in their revolution, are used either with or without tightening pulleys. Also ropes and chains working into pulleys with slightly serrated surfaces are used in conjunction with tightening pulleys.

The remainder of the specification describes implements for ploughing and cultivating land, which will be found in the series of abridgments devoted to that subject.

[Printed, 10*d*. Drawing.]

A.D. 1861, May 6.—N° 1145.

BURCH, Joseph.—This invention relating to steam boilers and apparatus connected therewith, consists,—1st, in the use of curved water tubes within the upright furnaces of vertical boilers, the upper ends of such tubes being attached to the crown, and the lower ends to the sides of the furnace, a little above the burning fuel; the tubes may be of iron, but copper is preferred; the water in the side and upper water spaces is constantly circulating up the tubes. 2nd, the use of fire-brick or metal obstructers or distributers, for the purpose when placed in the furnace amongst the water tubes, of causing the flaming gases and products of combustion to permeate all parts of the furnace before entering the flues; the obstructers are supported on small brackets fixed to the tubes and furnace sides. 3rd, consists of indenting tube plates at those parts of boilers where tubes are inserted at other than right angles, in order to avoid oblique joints. 4th, the use of a circular frame on fixed rollers for supporting the furnace bars, such frame being made to rotate when required, for the purpose of cleaning, feeding and regulating the fire. 5th, the use of an internally fluted valve box for a ball valve, instead of the ordinary cage.

This invention is supplementary to Letters Patent granted to this inventor, referred to as bearing date 19th October 1860.

[Printed, 10*d*. Drawing.]

A.D. 1861, May 7.—N° 1150.

NEWTON, William Edward.—(*A communication from Daniel Prindle.*)—This invention for "boiling substances and generating "steam," relates to an apparatus which may either be used as a

cauldron or as a steam generator; it consists of two hemispherical vessels which when united form a spherical steam generator, but when required for use as a cauldron for boiling purposes, the upper or inverted half which forms the dome is removed; around the rim of each half there is a projecting flange, which turns back all round the extreme edge so as to form a shallow lip at right angles with the face of the flange; at equal distances round the lip of the upper or dome half, there is a number of open shallow serratures forming a series of slight gradients, whereon, when the flanges of the parts are being united to form a steam generator, a coupling clamp embracing the two flange lips, is forced along each incline, which so squeezes and beds the packing between the flanges, as to form a safe steam-tight joint. The under side of the flange of the lower or cauldron half rests upon the upper edge of a circular metal furnace, which leaves a flue space all round, so that the flaming gases play all over the cauldron bottom. On the top of the dome half there is a combined vacuum and pressure valve. A dripping pipe is connected to a funnel for supplying the apparatus with water, and a flexible steam pipe for conveying off the steam for use, is also attached to the dome.

[Printed, 8*d*. Drawing.]

A.D. 1861, May 9.—N° 1178.

CATER, Henry.—This invention relates to the construction of steam boilers of the upright class. The shell of the boiler is cylindrical, covered to form the steam space with a convexed top, whereon is a safety valve. The furnace, which is lofty, is placed in the centre surrounded by water space; it is set upon the inner rim of an annular metal casing or flue, the centre of which is the ash-pit. The furnace narrows to a conical form upwards, and opens into and supports a flat fire chamber, which is surrounded by water space and is covered by a convex top; this chamber is more than double the diameter of the top of the furnace, so that a wide overhanging margin is left all round; four vertical stay tubes form a water communication through the chamber; the flat ring plate which forms the bottom of the fire chamber, is a tube plate perforated to receive a circular series of fire tubes, which form a communication through the water space surrounding the furnace, between the fire chamber and the annular flue below. The fire door opens to the furnace through an opening in the

water space and shell of the boiler; the ash-pit is closed by a damper. The flaming gases rise from the burning fuel into the fire chamber at the top of the furnace, where after commingling they take separate courses down the circular series of fire tu es into the annular flue below, whence they pass out to the chimney. The water level is maintained at a safe distance above the top of the fire chamber.

[Printed, 6*d*. Drawing.]

A.D. 1861, May 10.—Nº 1186.

RODDEWIG, Ludwig William.—(*A communication from Frederick Schmidt.*)—This invention relates to the construction of steam boilers, with "an inner and an outer chamber, the inner " one of which is in more immediate contact with the heat of the " furnace, and is surrounded by the outer chamber, the water " level in the inner chamber being considerably lower than usual, " and that in the outer chamber being considerably higher than " usual. There is a pipe communicating from the upper part of " the outer chamber to the lower part of the inner chamber through " which the water passes from the former to the latter when it " has attained a sufficiently high level in the former. By this " arrangement the water, being fed into the outer chamber, is " made to circulate round the inner chamber in a direction con- " trary to that in which the heat passes along the flue around the " outer chamber from the furnace to the chimney."

The sediment collects in that part of the outer chamber which is not in contact with the fire.

[Printed, 6*d*. Drawing.].

A.D. 1861, May 16.—Nº 1256.

HUDSON, Bernard.—(*A communication from Antonio Grande Giovanni Battista Olivieri and Lorenzo Morigiardino.*)—This invention of a rotary steam engine wherefrom rotation is obtained in the first movement, consists in forming within a circular case, a semicular chamber or steam way concentric with the common centre: one end of this chamber is open to the steam port, and the other to the atmosphere; its inner side is formed by the periphery of a wheel, which is fixed to and revolves with the axis; acting upon studs fixed equidistant round the rim of this wheel are *four articulated piston-slides*, which are connected in opposite

pairs by means of central sliding links and short connecting rods within the boundary of the wheel. As the piston-slides in successive rotation reach the exhaust port of the semicircular steam way, they are closed by contact with a fixed roller, whilst by means of the connecting rods and central link, the opposite companion piston-slide, which is just then passing the steam port, is thrown out across the semicircular steam way, thus forming as the slides follow each other in rotation, successive abutments to be forced into direct rotative motion by the pressure of the steam current.

[Printed, 6*d*. Drawing.]

A.D. 1861, May 17.—N° 1261.

ALLAN, ALEXANDER.—This invention relating to locomotive engines, buffers and drawsprings, consists (1), in dividing the furnaces of locomotive engines by a narrow hollow water space partition, inclining downwards from the back to the front of the furnace which is provided with a door to each compartment, into which through hollow stays in the sides, air is admitted to assist combustion; the hollow partition is likewise fitted with tubular stays for the passage of the gases from one furnace to the other; fire-tiles are placed in the furnaces, which throw the burning gases back towards the door, and triangular water partitions are fitted to each upper angle of the furnaces, and one across suspended from the furnace roof, for the purpose of deflecting the gases and so compel them to cross over from the division in which they are generated to the other, before entering the boiler tubes. Air, by preference, is admitted to the furnace through perforated fire-tiles or cast-iron blocks placed on a dead plate at the back of the furnace bars. The ash-pan is divided and furnished with a door to each division, to regulate the admission of air. Alternate firing is recommended as necessary to effect the perfect combustion of smoke.

2. Relates to the use of metal tubular connections with ordinary screw couplings for conveying water and steam between the engine and tender, a portion of the length of such a tube to be curved or tortuous, in order that it may yield to the bending strain which is thereby distributed over a considerable portion of its length. The tubular connections are shown in combination with a Giffard's injector placed above the tube plate.

3. Relates to a mode of increasing the adhesion or bite of driving wheels upon rails whilst ascending inclines or starting heavy trains, by causing the weight of the engine at such times to bear more exclusively on the driving wheels, which is effected by the pressure of steam admitted temporarily into cylinders so placed that their pistons, by means of levers, throw an increased portion of the weight of the engine on the driving axle, the other with the travelling wheels being correspondingly relieved.

4. Relates to buffer and draw springs, which are volute coniform of various sections and of uniform or varying thicknesses of steel, suitably placed singly or in pairs, base to base, or apex to apex, with a sliding plate between, combined or not with other springs of vulcanized rubber. Flat volute springs which become coniform when strained, are also used. Various applications of these springs are shown and described.

[Printed, 1*s*. Drawing.]

A.D. 1861, May 18.—N° 1279.

STEVENS, Benjamin Franklin.—(*A communication from Simon Stevens.*)—This invention relates to "tractomotives," or engines for running upon common roads or unprepared ground, without the interposition of trams or rails, for the purpose of either travelling alone, of hauling agricultural implements, or setting in motion carriages attached thereto in the usual way. The chief novelty consists in the use of a travelling drum or cylindrical shell, and the manner in which the power is applied thereto. The engine and boiler, which is of the vertical class, are mounted upon an ordinary frame supported in front by a guiding wheel, which is provided with ordinary steering apparatus, operated by hand. The after part of the frame is supported by two V-grooved driving pullies which are fixed on the ends of the crank shaft. These pullies rest upon two annular rails or rings which are fixed respectively round the inside of the ends of the drum. The crank shaft passes through the drum, which has neither arms nor axis. The crank arms are fixed outside the grooved pullies at the extreme ends of the shaft; they are actuated by the connecting rods from two horizontal cylinders, disposed respectively at the sides of the machine. An ordinary link motion with reversing gear is provided for operating the steam valve. The length of the *drum which rolls along* the ground transversely extends the

whole width between the side frames, and being without axis is kept in position fore and aft by two pullies at each end, which loosely revolve on strong studs fixed to the side frame about on a level with the centre of the drum. The peripheries of these pullies are grooved in the same manner as the driving V-pullies so as to receive the V edge of the annular rings; the drum is pressed and caused to roll forwards by the front pair when the machine is advancing, and to roll backwards by the pressure of the other pair when the motion is reversed. The water tank is disposed inside the drum, supported across the machine by the side frames at each end, so that the greatest portion of the weight is brought upon the driving V-grooved pullies, which bite upon the annular rails and thereby set the machine in locomotion.

[Printed, 6*d*. Drawing.]

A.D. 1861, May 21.—N° 1295.

AVELING, Thomas, and RAWLINSON, Henry.—This invention relates to "the construction of locomotive engines," for agricultural purposes: it consists in bringing the steam dome, which communicates with the interior, to the fore part of the top of the boiler, and arranging its form so as to act as a steam-jacket for the cylinder which is placed therein: means are provided by the removal of covers for gaining access to the slide box, throttle valve, and other parts; the exhaust steam blows up the funnel. By this arrangement no steam pipe is required, and only a very short blow off-pipe for the exhaust. The funnel is made of cast-iron, which is more capable than wrought-iron of sustaining the intense heat to which its base is exposed. The boiler is cylindrical from end to end, excepting a dip for the ash-pit. The ends, top, and bottom of the water tank, are formed by cast metal flanged plates bolted to side wrought-iron plates, which are bolted or rivetted to the axle plates supported by the fire-box. The draw bars are tapered towards their ends, to cause them to yield under concussion; they are made of angle or T iron bent to right angles at their ends, which are rivetted to the side plates of the tank.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, May 21.—N° 1297.

SYKES, Thomas, SYKES, Benjamin Clifford, and CROSS-*LEY, James* William.—This invention relates to boilers and

furnaces, comprising modifications of an invention for heating water and other fluids, generating and superheating steam, preventing incrustation in steam boilers, and consuming smoke, for which a patent was granted to these inventors bearing date 21st March, 1860, N° 732. It consists (1), in placing a number of cylindrical shells concentrically within each other, of such successive diminished diameters as will form alternate annular water and flue spaces between them. Upon the outer shell a vertical chamber is fitted wherein the water level is established; the upper part is steam space which communicates by a pipe with the central cylinder where the steam which is supplied to the engine is superheated by the surrounding flue space; the annular water spaces communicate with each other through short tubular connections; an external pipe opening into and extending from the lower part of the vertical chamber to the lowest water space in the boiler assists the circulation. In all the modifications the annular water spaces are completely filled: the water in all cases rises into the vertical chamber, where, as before stated, the working level is established.

2. Fixing a metal or fire-clay plate within the furnace above the fire whereon the green coal is first thrown; when formed into coke it is pushed off to feed the fire; also, in order to prevent the admission of large quantities of cold air consequent upon opening the furnace door to feed, the mouth of the furnace is projected and a hopper fixed thereon, through which the coal falls upon a plate, which on being withdrawn when the hopper is closed, drops it upon the dead plate, whence it is pushed forward by the fireman's rake, which is introduced through a shallow door just large enough for its admission.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, May 27.—N° 1331.

LEE, Joseph, and TAPLIN, Benjamin Dutton.—This invention relates to portable or traction engines, and apparatus for cutting joints, &c. 1. The engine is of the ordinary kind fitted with one or two cylinders and mounted upon four travelling wheels; the traction gear consists of a pitch chain working upon a small tooth wheel fixed on the crank shaft, which actuates the after axle of the carriage by means of the chain working on a large *tooth wheel fixed thereon*; this axle is supported on bearings

resting on brackets fitted to the furnace end of the boiler; these bearings are made to slide or adjust to length, when the chain requires tightening, by means of adjusting screws or otherwise. 2. Consists in the use of a screw fitted under the front end of the boiler for the purpose of adjusting the level when travelling up or down gradients on the road. Fitted to the bed of the front carriage is a hollow casing wherein a spherical nut is placed to receive a vertical lifting screw upon which the front end of the boiler rests; a crown wheel upon the screw is actuated by a pinion and short shaft whereon is fixed a worm wheel, which obtains motion from the engin driver by means of a worm upon the end of a side shaft at all times under his control. 3. For cutting and forming movable joints on the heads of connecting rods and other articles, a number of circular refined steel cutters are packed with intermediate metal washers upon a mandrel a suitable distance apart corresponding to the dimensions of the joint to be made; the mandrel is threaded near each end whereon nuts hold the cutters and packings firmly together. The mandrel so furnished is revolved between the centres of a lathe, and the connecting rod to be jointed is fixed to the slide rest, and advanced endways against the peripheries of the cutters, which, by cutting into the solid metal, form open mortices.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, June 1.—N° 1380.

SHEPARD, WILLIAM ALBERT.—(*Provisional protection only.*) —This invention relates to the construction of steam boilers. The " fire-box is surrounded on its four sides with thin water spaces, " and the water spaces in front and back of the boiler are con- " nected by several vertical narrow water spaces which are arranged " parallel to each other and to the sides of the boiler. These " narrow water spaces are above the fire-bars, and cross the fire- " box in a direction from front to back, narrow parallel spaces " being left between them to permit the heat and products of " combustion to rise up between the narrow water spaces to the " top of the fire-box or chamber, and to pass off from thence by " a chimney or funnel, which rises up from the top of the fire-box " or chamber through the steam chest or upper part of the boiler." To aid the combustion of the fuel, jets of steam are admitted into the passages between the narrow water spaces, which are

made deepest at their back ends in order to cause the steam and water to pass constantly in one direction, and thus produce a continual circulation through them.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 4.—N° 1402.

HANCOCK, James Lamb, and HANCOCK, Frederick Lamb.—The first part of this invention relates to "implements "for pulverizing, ploughing, and grubbing land," which will be found described in the series of abridgments devoted to that subject. The invention also relates to applying motive power for working agricultural implements, and consists "in the employ- "ment of a portable engine set upon wheels, furnished with a "reservoir for containing compressed air or gas, which is forced "into the said reservoir through pipes, tubes, or mains from a "stationary engine; or, instead of the reservoir containing air or "gas, it may be used as a vacuum chamber, and the stationary "engine may be made to exhaust the same, when the portable "engine will be worked as a vacuum engine." A diagram upon sheet 2 of the Drawings shows the practical application of this part of the invention, which also consists in providing "the "stationary engine for transmitting the power to the portable "engine with two or more condensers to each cylinder, and one "or more air pumps. The pump is made to act through different "tubes upon each condenser alternately, the cylinder being in "connection alternately with the condensers; and we provide an "escape for a part of the steam, after doing duty from the "cylinder, into a chamber or into the open air before passage is "opened into the condensers."

The latter part of this invention is applicable to condensing engines generally.

[Printed, 1*s*. 4*d*. Drawings.

A.D. 1861, June 6.—N° 1424.

RIGBY, Hugh, and LOWE, Peter Warburton.—(*Provisional protection only.*)—This invention relates to steam boilers, and consists,—1. In making the tubular flues of boilers larger in diameter at the furnace end and gradually tapering towards the smoke box, in order to cause a more effectual impingement of heat on the heating surfaces. 2. Connecting the furnaces of two

flued boilers by a passage, through which the flaming gases alternately pass from one furnace to the other; each flue is fitted with a damper, and connected by external flues with the chimney. When fresh coal is fed to one furnace, the ashpit of the other is closed with a damper, and vice versâ, in order that the smoke emitted by the fresh fuel may pass through the passage, and be consumed over the incandescent fuel in the other furnace, air being admitted therein at the same time to assist combustion.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 8.—N° 1463. (* *)

O'HANLON, Patrick.—Improvements in boiler furnaces.

"Instead of conducting the current of heat and smoke from "over the bridge at the back of the grate into the smoke chamber, "I either close or partially close up the space between the roofs "of the respective fire-boxes and the bridge, and cause the cur"rents of heat and smoke before reaching the before-named "smoke chamber to pass through an intermediary passage "through a series of tubes and flues."

"By my improved arrangement the hot currents are caused to "enter the smoke chamber through the top of the fire-boxes "through a series of openings, whereby the currents entering the "openings placed more forward are made to pass over those "openings placed more in the rear, thereby causing the combus"tion of the denser particles of the said currents."

[Printed, 8*d*. Drawing.]

A.D. 1861, June 10.—N° 1472.

ARMSTRONG, Robert.—This invention relates to marine and other steam boilers and apparatus connected therewith. It consists in uniting two or more vertical cylindrical boilers of the class described in the Specification of a Patent granted to this inventor, bearing date 14th December 1858, N° 1419. These boilers contain high central fire-boxes or chambers surrounded by water space. A number of horizontal partly oval water tubes opening to the water space at each end, are disposed at different angles across the central chambers; the shells of the boilers are united by a short tubular connection, sufficiently large to form an annular water space around a flue tube, which unites and forms near to the

top of each a flue communication between the central fire-box chambers. Only one boiler contains the fire furnace. The flaming gases rise, lap round, and course between the horizontal water tubes, then pass through the connecting flue tube into the central chamber of the other boiler, course downwards amongst the horizontal tubes therein, and exit near the bottom through a flue tube which communicates with the chimney through the water space and boiler shell. This boiler stands upon a cast-iron feed-water tank, containing near to one side a vertical partition, which rises to within half an inch of the cover; a convex thickening of the under side of the cover by dipping into and heating the water in the largest compartment, causes it to swell and flow over the partition into the smaller compartment whence the boilers are supplied. All sedimentary matters settle in the large compartment. Sometimes a third boiler is added, into which the products of combustion pass from the second; the steam generated is superheated by carrying the uptake from the central chamber through the steam space to a chimney above. By means of a lever and cross-bearer rod, the front end of every alternate furnace bar can be lifted to rouse the fire aad remove dust, and the inner ends of the intermediate bars receive a backward and forward motion from the action of a rocking transverse bearer rod, for the same purpose; the furnace bars taper from one end to the other, the lifting ends being considerably the broadest. When the heat of the products of combustion is not used to superheat steam, jets of air are forced in from each side of the furnace, to meet over the fire and commingle with the burning gases. To prevent priming, a scum shelf is fixed slightly below the water level round the interior of the boiler, and scum dishes, with serrated edges and provided with suitable outlets, are in some cases suspended from the crown of the boiler, or fixed, with means of adjustment, at the side; others open below the water level into an external vertical tube, which is connected to the boiler low down by another open branch; the ebullition of the water in the boiler keeps up a constant downward circulating flow in this vertical tube; all sedimentary matter sinks to the extreme end, and is there blown off by opening a valve. For preventing calcareous scale, oak staves, which yield tannin or matter which combines with lime, are disposed in the boilers under water, so as to form an inside lining.

[Printed, 1s. *Drawing.*]

A.D. 1861, June 10.—N° 1474.

ROLLO, David.—(*Provisional protection only.*)—This invention of "valves for steam and other engines" relates,—1, to slide valves for reversing the motion of engines, and (2) to a single rod arrangement for working the slide valve common to the combined high and low-pressure cylinder, as patented by his partner, James Jack, on the 14th October 1859, N° 2345.

The "arrangement for reversing, was mainly designed for " steam winches where two cylinders are used, one at each end, " with the connections to the shaft at right angles, in which case " the slide valve is placed between the cylinders and operated " by a lever, similar to the ordinary steam cock. From each side " of the valve are two steam pipes to each cylinder, either of " which can be used as supply or exhaust by a movement of the " lever. The final exhaust is through a pipe under or at the " back of the slide valve."

The "combined cylinder slide valve, is an arrangement with " passages in the same, which passages may conduct the steam " from either side of the piston in the high-pressure cylinder to " either side of the piston in the low-pressure cylinder, and this " by one rod or with one movement."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 14.—N° 1529.

LEEMING, James. — (*Provisional protection only.*) — This invention relates to steam boilers, furnaces, and flues, with regard to the perfect combustion of fuel, reduction of smoke, and apparatus for heating feed water. It consists in bringing the flaming gases and products of combustion into combination with admitted air, by contracting the opening into the flues of boilers beyond the furnace so as to form (by preference of brickwork or masonry) a narrow perpendicular draught way rising from the bridge, which is made lower than usual. In cases where the draught from two furnaces immediately enters one flue common to both, the contracted draught openings are arranged towards the side of each furnace, in order that their products of combustion may be brought into combination. The feed water heating apparatus consists of a cylinder filled with longitudinal tubes, which is interposed between the feed pump and the boiler,

and so placed in the main flue that the passage of the fire draught shall be through the tubes; the feed water forced on by the pump enters into the lower part of the cylinder, and after circulating amongst the tubes passes out and on to the boiler.

[Printed, 4d. No Drawings.]

A.D. 1861, June 14.—Nº 1533.

LEACH, George.—This invention relates (1) to a "steam "mole" for cutting, breaking up, pulverizing, and turning over the soil, which is referred to in the section of abridgments devoted to that subject. 2. To upright boilers for traction engines. The form is rectangular, with a shallow water space at bottom and combined water and steam chamber at top; the sides are encased to form water heating reservoirs, and thin water spaces form the back and front; the whole of the interior, excepting the furnace space, is filled with vertical water tubes set into tube plates, which constitute the bottom plate of the upper water space and steam chamber, and the top plate of the lower water space. The furnace is fed downwards by means of an opening formed through the steam chamber; baffling plates of fire-brick or metal are placed amongst the tubes, in order so to change the natural direction of the flaming gases, that they may more effectually play amongst the tubes; the position of these plates may be altered at pleasure; the exhaust steam is blown off up the chimney, which is oblong in plan, divided into compartments. The engine cylinders are placed at the sides of the boiler; their connecting rods are coupled to a crank shaft, which by means of a pinion gives motion to a spur wheel and counter shaft, wherefrom by the aid of chain wheels and chains the driving wheels and "steam mole" are set in motion.

[Printed, 1s. 4d. Drawings.]

A.D. 1861, June 17—Nº 1544.

SMYTH, Samuel Richard.—(*Provisional protection only.*)— This invention relates to the construction of steam boilers with their "upper and lower surfaces so curved as to form an arch, the "said surfaces being plain or corrugated longitudinally as may be "required, and provided with flange projections at the sides or "ends for taking into the brickwork or otherwise; at the upper "portion of the said boiler an arched or horse-shoe shaped steam

"chest is to be placed and secured centrally and longitudinally, "and furnished with suitable openings communicating with the "interior of the boiler for the flow or passage of the steam. By "this arrangement, the flues may be carried above and below the "boiler so as to extend the heating surface, and prevent the "exposure of any portion of the said boiler to the external air."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 18.—N° 1555.

MILLER, JAMES, and SKINNER, HENRY EDWARD.—This invention relates to rotary steam engines, and consists of a short fixed cylindrical chamber, through which a motion shaft passes; fixed upon this shaft within the cylinder is a barrel, about two-thirds the whole internal diameter, and corresponding in length, leaving in transverse section a crescent formed space; the shaft so passes eccentrically through the cylinder, that the barrel shall come in contact under the centre with the cylinder surface; a piston the length of the diameter of the cylinder and corresponding in width, slides diametrically to and fro in a mortice through the centre of the barrel and shaft as they revolve, covering and opening the ports at the required intervals in such a manner as to dispense with the use of slide valves. The ends of the sliding piston are so formed and arranged as to fit the interior of the cylinder in every part of its revolution; the steam and exhaust ports pass out at the cylinder ends on a plane with the centre of the shaft; the steam enters on one side of the barrel, and after driving the piston half round, exhausts on the other side; the steam acts in like manner on the other end of the piston, each end alternately forcing round the barrel and motion shaft successively half a revolution, whereby continuous motion is kept up.

[Printed, 6*d*. Drawing.]

A.D. 1861, June 18.—N° 1569.

KIRBY, JOSEPH EDWARD.—(*Provisional protection only.*)—This invention relates to a mode of regulating the slide valves of portable and other steam engines, and to machinery for transmitting motion to agricultural implements. The slide valve rod is connected to a sliding block upon a lever, one end of which rocks or oscillates on a fixed centre, whilst the other end is con-

nected to the excentric rod; the vibrations of the lever are uniform, but the length of traverse of the slide block depends upon its position on the lever, which is regulated by the height of the plane of rotation of the governor balls, acting upon the connecting gear which is arranged to move the slide block to and from the fixed end centre of the lever, whereby the length of action of the slide valve is varied. When the speed of the engine is too high, the governor connections diminish the stroke of the slide valve, by moving the slide block towards the fixed end centre, and from the fixed centre when the speed is too low; the speed is thereby either reduced or accelerated to the uniform working rate.

For transmitting motion to agricultural implements, two drums on and from which the wire drawing rope is wound and unwound, are placed loose upon an axis supported by outside travelling wheels, by suitable clutches either of the drums may be made to revolve with the axis, which receives motion from the crank shaft of the portable engine, by means of endless bands and pulleys; two or more of such bands may be used on grooved pulleys to ensure sufficient holding; or an endless chain and chain-wheel may be used. Whilst winding in, the wire rope is made to dispose itself with regularity on the surface of the drum, or on the previous layer of coils, by means of a traversing guide.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 19.—Nº 1572.

LOUCH, JOHN.—(*Provisional protection only.*)—This invention relates to furnaces for consuming smoke, to boilers, and condensers for steam engines, consisting:—1. In constructing grate bars for furnaces with two or more plates or bars of iron, which are so rivetted or bolted together, as to leave suitable air spaces between them. 2. Consists in so fixing metal tubes within furnace doors, that they project into the furnace and form air passages, in passing through which the atmosphere becomes heated, and by igniting when commingled with the gaseous products of combustion over the fire, effect a consumption of all the visible exhalations from the burning fuel. Perforated fire-brick may be used for the same purpose. Perforated air tubes with closed ends extending over the burning fuel are also introduced; and tubes opening to the atmosphere at one end and into the furnace at the other, are passed through the boiler for the purpose of heating the air.

3. Relates to surface condensers, wherein thin films or fine jets of water are made to run over the condensing surfaces, whilst currents of air forced by a fan, or drawn through by the chimney draught are made to pass amongst them; the condensing surfaces may be covered with cloth or fibrous material to absorb and prevent a too rapid flow of the watery films. Short tubes in which one or both ends of the condensing tubes, by the aid of india-rubber cement, accurately fit, are fixed in the tube plates to provide against the effects of unequal expansion and contraction. The condenser tubes are maintained air-tight by a sheet of india-rubber, so moulded as to form a surface of short projecting tubes, which embrace and fit tightly around the ends of the condenser tubes.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 19.—Nº 1578.

FAULDING, Joseph.—This invention relates to locomotive engines; "consists in so combining the mechanical parts of a "locomotive engine that all the momentum resulting from the "working of the various parts of the engines shall be on the "longitudinal central line of the locomotive; to effect which I "place the two cylinders of the locomotive at right angles to each "other, or thereabouts, and unite the connecting rods of each to "one central crank pin on the driving axle. I do not confine "myself to any particular positions for the cylinders, so long as "they work at right angles to each other, but I prefer that one "of the cylinders should be vertical over the crank shaft, and "the other cylinder horizontal, the connecting rod of each being "connected to the central crank of the driving axle."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 21.—Nº 1598.

HANNAN, John, and HAMILTON, John.—(*Provisional protection only.*)—This invention relates to constructing power indicators for steam engines so as to render them accurate and certain in working. The new indicator is made with a spring so contrived that inaccurate indication caused by the increased friction due to the coiling and uncoiling action of the spring, is compensated. The spring consists of equal parts having opposite twists, arranged so as to act together. The pencil holder of the new

instrument crosses the tube containing the spring so as to bear directly against a revolving barrel; the pencil is pressed gently towards the barrel by a small spring, which, notwithstanding inequalities in the surface keeps the pencil point in contact with the paper on the barrel; the pencil is kept from touching the paper when not required to mark.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 21.—N° 1602.

HOBSON, William, and CAVILL, Thomas.—This invention relates to metallic packings for pistons, and consists in the use of two or more rings placed in the usual manner side by side between the top and bottom piston plates; extending all round the inner surface of each ring, there is a close series of cross grooves, for the purpose of increasing their flexibility. At the point of its circumference where each ring is divided, it is formed to receive the end of a wedge, which is gently forced out of the body of the piston by means of a spiral spring; to each ring a separate wedge and spring act as cushions, when the condition of the internal surface of the cylinder requires distension or otherwise of the packing rings, in order to maintain the piston steam-tight.

[Printed, 6*d*. Drawing.]

A.D. 1861, June 27.—N° 1641.

GRIMALDI, Filippo.—(*Provisional protection only.*)—This invention is supplemental to a previous invention relating to the "instantaneous generation of steam," for which Letters Patent, dated August 9, 1860, No. 1927, were granted to this inventor.

By the present invention, 1st, fire tubes are to be added to the rotary boiler, which is not entirely enclosed in the furnace, one end being in the smoke chamber; the flaming gases course from the former to the latter through the tubes. The boiler can be made of two cylinders, connected together by a neck and a circle of separate water tubes; one cylinder is fitted with tubes, and the other without; the water and steam communication is free between them. 2. Making the trunnions, by which the boiler is supported on its bearings at its ends, hollow, the one for the entrance into the boiler of the feed water pipe, and the other for the water gauge and steam passage pipes from the boiler. 3. Bending the *steam pipe* upwards, so that it may always take

by continuing the action of the screws, the engine and chain are raised, and left free to move round on the running wheels.

2. Preventing priming in the boilers of such portable engines, by suspending the boiler from a centre of oscillation above so that at all times it shall maintain a horizontal position; the steam leaves the boiler by a pipe concentric with the gudgeons on which the boiler is suspended. The feed pipes swivel on joints, which allow for the motions of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 3.—N° 1693.

SPENCER, John Frederick.—This invention relates to steam engines and apparatus connected therewith, consisting, 1, in working the pumps for supplying cold water to surface condensers, by an engine with steam from the main boiler or from an auxiliary boiler, but separate from the main engine. 2. A novel apparatus and mode of working the combined air and cold water pump, patented by this inventor 16th November 1857, or the cold water pumps only, in connection with his arrangement of surface condensing engines, as patented by him 29th March, 1858, N° 661, and the 17th January, 1860, N° 120. Arranging by means of a lever or levers attached by one end to the piston rod and crosshead, that the load of the pump on its downward stroke shall help to counterbalance the weight of the steam piston and moving parts in connection. 3. Relates to an improved method of replenishing the waste of fresh water in such engines as are worked with surface condensers, whereby fuel is economized, by raising the temperature of the feed water; this is effected by the application of a heater in connection with a vaporizer connected to the main boiler; the salt or foul water is admitted on one side of the metallic surfaces of the vaporizer, whilst the water or steam, or both, from the main boiler are brought in contact with the other surfaces, whereby steam is generated from the salt water, and is carried off by a pipe into the heater which is a separate section of the apparatus, through which, in other channels formed by groups of tubes, the feed water takes its course to the boiler, and thence, the remains of the new steam and the water condensed therefrom pass out to the condenser.

[Printed, 10d. Drawing.]

A.D. 1861, July 4.—N° 1702.

NEWTON, William Edward.—(*A communication from Robert Rogers.*)—This invention for obtaining motive power by the elastic force of steam and air combined, consists in the mode of effecting a commingling of the air possessing only the ordinary atmospheric pressure, with the steam out of a boiler under pressure. Hitherto the operation has been performed by the interposition of an air pump, which absorbs a certain per-centage of the power of the engine. By this invention the force of the current of steam on its passage from the boiler to the engine is made to drag with it the required quantity of air. Within a chamber or aspirator closed by a flap valve opening inwards, the steam pipe from the boiler terminates in a tapering nozzle, which points into the mouth of the receiving or steam pipe leading to the engine; the distance between the nozzle and the mouth must be slight, but sufficient for the passage of air. When the steam is turned on, it passes from the nozzle into the mouth of the receiving pipe, with such velocity as to draw with it out of the aspirator a large amount of air; the commingling of the air and steam takes place while the mixed current is coursing on to the engine. The flap valve does not control the quantity of air supplied to the aspirator, it only operates to check a back pressure of steam when, from any cause, the speed of the engine diminishes. Air may be super-added to the quantity already taken up by the steam, by the use of flap valves, opening inwards, attached to each end of the cylinder, and by so timing the slide valve, that the induction port shall remain closed until the momentum of the fly-wheel or machinery has carried the piston a short distance on its return course; the vacuum thereby formed in the end of the cylinder draws in the air, which ceases the moment steam is admitted and closes the valve. Air may be advantageously mingled with steam for sounding steam whistles.

[Printed, 10*d*. Drawing.]

A.D. 1861, July 6.—N° 1727.

HANDCOCK, Elias Robison. — This invention relates to "machinery for obtaining and applying motive power," whereby the motion of a steam engine is made continuous while turning the dead centres *or neutral* points of the crank unaided by the *momentum of a fly-wheel*; and consists in more effectually carry-

ing out the principle of a former invention for which Letters Patent bearing date 8th April, 1859, N° 885, were granted to this inventor. Two cranks fixed on the driving shaft are employed, the connecting rod which couples to the throw of one crank is furnished at its opposite end with clips which work on a loose excentric on the crosshead, and the outside connecting rods, which couple to the throws of the second crank, work through suitable holes formed in the ends of the crosshead, where they are held by pins at a certain part of the stroke, and freed at the proper moment by contact against projections on the crosshead guides. The two cranks are thus made to reciprocate, alternately helping each other over their dead centres. Several modifications are shown and described, varying in some of the details without departing from the use of two cranks and the loose excentric.

[Printed, 8*d*. Drawing.]

A.D. 1861, July 10.—N° 1744.

CHELLINGWORTH, THOMAS TERTIUS, and THURLOW, JONATHAN.—This invention relating to traction engines, consists in constructing the framing of plate iron placed edgeways in four parallel rows, forming a longitudinal central space which contains the boiler, and two narrow side spaces in which the upper half of each driving wheel revolves in inner and outer spring bearings connected to the framing, which narrows in at the front end to form the fore carriage; the cylinders are placed on an incline, partly in the side spaces over the hind wheels; the boiler is supported by side trunnions fixed near the fire-box end upon bearings fixed to the framing; the smoke box end rests upon a vertical screw, operated by the pawls of two ratchet wheels and bevel gearing in either direction, whereby the water level is maintained by raising or lowering the end of the boiler, which is thus kept in a horizontal position while the engine is ascending or descending inclines. Both ends of the cylinders are fitted with stuffing boxes; the feed pump is disposed in a line behind one cylinder and the tank pump behind the other, the plungers being fixed on their respective piston rods are thus worked direct. The boiler feed pipe is composed of plug and socket pieces and connecting bends, which adjust themselves according to the changing position of the boiler, through which the exhaust steam is taken on its passage to the chimney, in order that it may be desiccated

and pass off in thin invisible vapour. A superheating chamber with tubular passages is arranged in the smoke box. The fore carriage is supported on steering wheels, which are operated by means of a worm and toothed segment fixed to the lower framing of the fore carriage and actuated by bevel gearing through an upright spindle. The driving wheels are formed in two parts, each with a separate nave and set of spokes and felly welded together; the two parts are fitted and bolted with wood packing between their fellies within a surrounding ring, around which between it and the tire there is a packing of vulcanized india-rubber; jointed to the strap of an excentric which is fixed between the naves, there is a number of radiating rods, that give radial motion to a set of spades, which, as the wheel revolves, slide through and project more or less from the face of the tire; the wheels are driven by a pinion on the engine shaft, which gears into an internal toothed wheel fixed to the inner side of one of the driving wheels; a friction band is made to operate on the plain surface of the internal toothed wheel when it is necessary to check the speed of or stop the engine. When used "for the purpose of raising or lowering "weights, shear legs are fitted in sockets attached to the back "frame of the engine, and are supported by guys attached to the "front part of the framing; a rope passing over a suitable pulley "or pulleys is affixed to the shear legs, and thence over a drum "or barrel on one of the before-mentioned shafts. The other and "remaining shaft is used for driving machinery by means of a "rigger or drum affixed to the same. Both the said shafts "receive their motion from the crank shaft by means of spur "wheels and pinions, and can be disconnected from each other "and also from the crank or driving shaft by hand clutch wheels "and right-hand and left-hand screws on the same shafts, so that "the engine may be used for traction purposes, driving machinery, "or as a steam crane, either separately and distinctly or simul-"taneously."

[Printed, 4*s.* 8*d.* Drawings.]

A.D. 1861, July 11.—N° 1746. (* *)

WESTON, George, and WESTON, James. — (*Provisional protection only.*)—"Improvements in rotary steam engines and "pumps."

A wheel is fixed on a shaft and caused to revolve within a case. In this wheel are slots or grooves, into which from three to eight

sliding pieces are fitted. Circular grooves are made in the sides of the case, and sliding pieces equal in number to those in the wheel are fitted therein. As the wheel revolves those sliding pieces move backwards and forwards in such a manner as to have a constant surface for the steam to act on, "and so produce a "uniform motion without the aid of a fly wheel." "Stuffing "boxes are fitted to the outer case around the shaft to prevent "the escape of steam."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 11.—N° 1750.

FARRON, JAMES.—This invention of apparatus and fittings for steam engines and boilers relates (1), to governors, the rising and falling of the arms of which as the balls gyrate at different levels, are, by means of a pair of bevels on the slider, made to turn a bevel wheel (which is geared into them) in opposite directions, in accord with an increasing or diminishing speed of the engine. The bevel wheel is fixed on the end of a screw, whereon a nut by means of levers and connecting rods in communication with the link of the throttle valve, is made to regulate the speed of the engine, or if connected to the slide or tappet valves, to regulate the working expansively. 2. Lubricating steam cylinders: the lubricant is contained in a spherical vessel, wherein a vertical plug operated by a handle above, is made to regulate the supply; the down tube entering into the cylinder, is closed at the extreme end for the purpose of spreading the lubricant as it escapes through lateral perforations round the end. 3. Lubricating piston rods;—within the tallow cup placed near the piston rod, there is a small steam chamber, the external heat of which maintains the tallow in a liquid state without admixture with watery particles; the melted tallow is supplied through a tube. 4. Instead of placing the taps of water gauges in the passages leading from the boiler to the glass tube, they are placed in a line with the tube; the plugs are fitted with stuffing boxes; the taps are not set fast by sediment.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, July 12.—N° 1757.

ADAMS, WILLIAM BRIDGES.—This invention relating to locomotive engines and trains, consists in so arranging either the

leading or trailing wheels of engines or carriages, that each pair of wheels with their axles may be made to traverse laterally, and in a forward direction, so that on curved rails the axle may always point to the centre of the curve, and on straight lines be at right angles therewith. For obtaining this movement, the guards which hold the axle boxes, and the boxes are formed in a curve struck from about the centre of the next axle, so that when running on a curved line, the pressure of the wheel flanges against the rails will cause curvilinear movement to take place, and when on straight lines maintain the axles in their true position. The top of the axle boxes are curved so that the spring bearing will rest in the centre until the curves are passed over. The wheels are hollow, carrying the lubricator on a bed of water, wherefrom it flows through holes in a thin metal lining on the axle, along which it finds its way to the bearings.

The invention also relates to the structure of cylinders and their position. Attached to the piston crosshead is a lateral sliding bar which works in a groove in the fixed slide bars and through a recess the whole length of the cylinder; a stud pin is fixed in the bar on which the connecting rod is coupled, and space for a long connecting rod is obtained, irrespective of the position of the cylinder as regards distance from the driving wheels. By this arrangement, although cylinders of locomotives be placed in the smoke box, they will work with outside connecting rods; also—

For the purpose of heating the boilers of locomotive engines, whether for land or marine purposes, oil or other inflammable liquid is applied in drops upon surfaces heated to incandescence; the generation of gas instantaneously follows, which commingling with atmospheric air made to enter the fire box at convenient openings, is immediately flashed into flame. The oil cistern or reservoir is either placed above the fire-box, or the liquid may be forced up from below; either animal, vegetable, or mineral oil may be used for the purpose.

[Printed, 1*s*. Drawings.]

A.D. 1861, July 13.—N° 1760 (* *)

RYDILL, George.—(*Provisional protection only.*)—" An im-" proved smoke *consumer* and condenser," suitable for railway *engines, &c.*

"I set the boiler inner flue with fire-bricks with a chequered "roof or plain invert; the ash place or box with bricks with a "tongue and groove, fitting into each other at the bottom, top, "and ends. I place in the flue any kind of openwork of iron, "copper, brickwork, or stone; the brickwork fixed round the fire "forms a retort, which gives a steady heat to the boiler; hot air "is admitted from the boiler, house, factory, or any other place. "The smoke from the fire or fires passes into the flue or flues, "where it is played upon with water springers, hot or cold being "used, which is conveyed from the boiler or boilers by means of "a pipe or pipes; the water playing amongst the smoke as it "travels along towards the chimney causes a combustion and a "condensation to take place."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 13.—N° 1763.

BEAMISH, Isaac, and BEAMISH, Noah.—(*Provisional protection only.*)—This invention relates to apparatus for lubricating those frictional parts of steam engines which are exposed to the action of steam. The apparatus is similar in construction to a double action force pump, by the aid of which the lubricant is injected in small quantities into the steam pipe near the valve box, amongst the steam, to be carried therewith to the seating of the slide valve, the cylinder and piston, and other of the working parts of engines impinged on by the steam. Valves are interposed to prevent the escape of steam when the injection of the lubricant takes place.

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 17.—N° 1794. (* *)

HARNETT, Andrew William.—(*Provisional protection only.*)—"Improvements in the construction of steam engines, air "engines, and pumps." "The inner surface of the cylinder, "and the outer surface of the piston and piston rod, all or either "to be so formed by any mode of rifling, as to cause to be im-"parted to the piston a spiral movement when in motion."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 17.—N° 1797.

PARKER, John, WELLS, Joseph, and WELLS, Benjamin.—(*Provisional protection only.*)—This invention relates to steam

engines, boilers, furnaces, and apparatus, and consists in constructing cylinders and pistons so as to avoid friction and dead points, and to balance the pistons in motion. "Two or more "cylinders of unequal diameters are cast together side by side, "opening to each other with stuffing box covers at each end. "The pistons are of diameters equal to the interior of the "smallest cylinder, and of the same lengths as the interior "lengths of the cylinders. The piston of the small cylinder "has a longitudinal groove of suitable size and form to receive "a corresponding longitudinal feather, tongue, or projection "formed on the other piston or pistons when their surfaces are "placed together, and caused to roll in contact with each other "in the cylinders. The piston rods or axes passing through the "stuffing boxes are geared together outside by equal wheels. "The feather or tongue is made to project from the body of the "piston, according to the area required for steam in the cylin-"der. Steam is admitted to the larger cylinder through a "double-action conical equilibrium valve at one junction of the "cylinders where it acts upon the feather, tongue, or projection, "causing the piston to rotate therein, and is exhausted at the "other junction, from which it may be conducted to another "similar cylinder and piston to act in like manner, and thence by "means of a bracket wheel returned to the lower part of the "boiler. The ends of the pistons are recessed, and projections "are formed on the covers to enter therein, leaving spaces for "steam on the inlet side to balance the piston. Tubes are placed "in the boilers opening at each end of the fire bed, and arranged "in such manner as to cause the most intense heat of the fire to "circulate therein to accelerate the generation of steam, and jets "of steam may be introduced to promote circulation of the heat "or flame. The door frames, dead plates, and fire-bars are made "hollow for the passage of atmospheric air to the furnace to "promote combustion of the gases, such hollow grate bars, by "preference, we make in two parts."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 17.—N° 1803.

TRIGWELL, James.—(*Provisional protection only.*)—This invention is for the *purpose* of relieving the working surface of the *slide valves of engines* from the friction caused by steam pressure

on the back. A rod carrying a piston is fixed to the back of the slide valve at right angles with its seating; the piston works steam tight in a cylinder, which, although not fixed thereto, is made to traverse with the slide by means of guide pieces cast or fixed thereon. The cylinder is supported in position by rods sliding in fixed bearings; its upper end is closed against the steam, but by means of a small connecting pipe which works through a stuffing box in the end of the valve box, a communication with the atmosphere is established. The steam acting upwards against the under face of the piston counterbalances the weight or downward pressure of the steam on the back of the slide, whereby the working surfaces are relieved. A flexible diaphragm attached to a plate piston connected to a rod fixed to the back of the slide, and made steam-tight round the bottom rim of the cylinder, may be employed to effect the same result.

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 23.—N° 1849.

CLARK, William.—(*A communication from William Lighthall and Albert Nicholson Chrystie.*)—(*Provisional protection only.*)— This invention, relating to refrigerators for cooling injection water for marine engines, consists of a metal casing filled with tubes and suitable in form to the position it is intended to occupy; a current of cold sea water is kept up through the tubes of the refrigerator by two arrangements of pipes, one for supply and the other for discharge: the former opening towards the fore part of the vessel receives the sea water, the latter discharging it towards the stern, the motion of the vessel through the water causing a constant flow of water through the tubes, which are covered with gratings at their outer ends to exclude fish or other floating substances; by this arrangement a supply of fresh water is obtained for marine boilers, and by using the fresh injection water from the ordinary jet condenser, which water by passing from the hot reservoir through the refrigerator is cooled to the temperature of sea water, a constant supply of fresh water for the boiler feed and for condensation is kept up. The supply to the boilers is regulated in a self-acting manner by placing the tubes which conduct the injection water to the refrigerator and the feed water to the pump, upon or in the hot well in such relation with each other as regards their point of junction, that the first-mentioned tube

receives a complete supply before any hot water passes into the latter, "the first amount being that which has been employed for "condensing the steam in the condenser, and consequently the "amount to be returned to the refrigerator to be used again, and "the latter amount being that produced by the condensation of "the steam in the condenser, & consequently the amount to be "returned to the boiler, to furnish the necessary quantity for "vaporization." Metal diaphragms or partitions are so placed in the refrigerator that the injection water is compelled to pass and repass amongst the tubes, which ensures its perfect cooling.

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 24.—N° 1851.

HUGHES, Thomas.—This invention relates to a steam generator, which may be constructed for a diagonal or vertical position; according to its application for driving marine, locomotive, or stationary engines. The boiler in a vertical position is preferred and described; it consists of a long vertical hollow stem or pipe centrally placed within the walls of a circular brick-built furnace; the lower end of this stem-pipe is contracted and flanged to rest on a foundation at the bottom of the ash pit; the fire-grate is made annular by the central stem pipe which rises through the centre, where, close above the furnace bars, it is protected by a cast metal shield; a series of four spirally formed tubes are vertically ranged round the stem pipe, so as to fill the space between it and the furnace wall; all the lower ends of the spiral tubes communicate with the stem pipe at the same level within a short distance of the fire, and their upper ends open into it just below the top, which supports a flat circular steam chamber of much larger diameter; fitted into and between the projecting bottom and top plates of this chamber there is a circular range of vertical superheating fire-tubes, through which the products of combustion and flaming gases after playing round the stem pipe and amongst the tubular spirals, rise and pass into a surrounding metal case, and thence through a flue to the chimney. A steam dome fitted with the usual appliances is placed on the steam chamber. The water feed pipe is connected to the stem pipe below the furnace bars, and a blow-off pipe is fitted to its extreme end; the working water level is maintained in the stem pipe a little below its opening junction with the steam chamber.

[Printed, 10d. Drawing.]

A.D. 1861, July 25.—N° 1867.

SPINK, Daniel.—(*Provisional protection only.*)—This invention, relating to steam engines, "has for its object the regulating of the "pressure of steam on the pistons of steam engines when it is cut "off from the boiler, and is effected in the following manner:— "I propose employing a separate vessel or vessels in connection "with the cylinder and steam pipe of the boiler, the pipe having "a valve or valves to cut off the steam in separate vessel or "vessels from the boiler at the beginning of each stroke of the "piston. At each end of the separate vessel is also a regulating "valve to admit the steam gradually to press alternately on either "side of the piston, so that if the steam enters the separate vessel "of one-eighth capacity of cylinder, for instance, say, at 25 lbs. "pressure, and then is cut off from the boiler and is allowed to "expand through the entire stroke it has pressure of about 10 lbs. "per square inch maintained throughout every portion of the "stroke of the piston in the cylinder, so that nearly the same "effect is produced as would be by cutting off the steam in "the cylinder at one-eighth of the stroke, with the important "advantage of an unvarying pressure throughout. The regulat- "ing valves are opened and closed alternately to allow the steam "to enter either end of the cylinder from the separate vessel, "and are worked by cams or excentrics, or by any of the usual "means; the size of the separate vessel may vary according to "circumstances, being in some instances of the same or even "greater capacity than the cylinder."

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 2.—N° 1920.

TURNER, Frederick William.—(*Provisional protection only.*) —This invention consists of apparatus for obtaining and applying the motive power of steam, which is admitted at a suitable pressure into one end of a submerged cylindrical shell, mounted concentrically within which there is a shaft of increasing diameter towards the mid-length, where it is furnished with a series of radiating helical blades; "truncated cone pieces" fixed inside the cylinder convey jets of steam to act upon the water in the direction to drive through the cylinder a constant current or artificial *stream*, which rotates the shaft by acting upon the helical blades. When two or more screws or sets of blades are disposed on the shaft within the cylinder, fixed blades are attached to the sides so

as to project obliquely therefrom between the revolving blades; these fixed blades prevent all circumfluent action of the water and direct it more effectively upon the revolving screws. When used for marine propulsion, the end of the cylinder projects from and opens out of the stern of the vessel; the helical driving blades are disposed round a boss upon the projecting end of the shaft within a ring of the same diameter as the cylinder; and radiating from the periphery of the ring other screw propelling blades are fixed to act upon the open sea water in the usual manner. In some cases, the stream of water after its passage through the cylinder is directed through a turbine wheel, thereby adding to the effective power of the apparatus; and for land purposes a circulation of the water may be kept up, sufficient fresh being added to prevent ebullition.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 3.—N° 1932.

O'HANLON, Patrick.—This invention relates to steam boilers, and especially to such marine and other boilers as are described, and for which this inventor received provisional protection bearing date June 8, 1861, N° 1463. The present invention relates, (1) to the economical consumption of fuel, and (2) heating feed water. The first consists in introducing a fan into the mouth of each of the longitudinal intermediary large flue tubes, which are supported upon and communicate with the furnace by short hollow necks, according to the said provisional protection; these fans are rotated by the flue draughts, and consequently transmit the smoke more regularly into the smoke box of the boiler; they consist of a series of blades fixed to a central spindle, which rests in bearings attached to the sides of the flue tubes, the shape of the blades being adapted to the form of the internal space. The front mouth of each flue tube is closed, with the exception of small adjustable openings for admitting air to the fans. Second, when the feed water is heated, the fans are omitted in the two side flue tubes, through which the feed pipe is centrally disposed; it enters at the front end of one side tube, passing through and out into the smoke box which it crosses, and enters the back end of the other side tube, and after passing through and out at the front end, is bent downwards and connected to the lower water space of the boiler, *communicating therewith* through an ordinary valve.

[Printed, 8d. Drawing.]

A.D. 1861, July 25.—N° 1867.

SPINK, DANIEL.—(*Provisional protection only.*)—This invention, relating to steam engines, "has for its object the regulating of the "pressure of steam on the pistons of steam engines when it is cut "off from the boiler, and is effected in the following manner:— "I propose employing a separate vessel or vessels in connection "with the cylinder and steam pipe of the boiler, the pipe having "a valve or valves to cut off the steam in separate vessel or "vessels from the boiler at the beginning of each stroke of the "piston. At each end of the separate vessel is also a regulating "valve to admit the steam gradually to press alternately on either "side of the piston, so that if the steam enters the separate vessel "of one-eighth capacity of cylinder, for instance, say, at 25 lbs. "pressure, and then is cut off from the boiler and is allowed to "expand through the entire stroke it has pressure of about 10 lbs. "per square inch maintained throughout every portion of the "stroke of the piston in the cylinder, so that nearly the same "effect is produced as would be by cutting off the steam in "the cylinder at one-eighth of the stroke, with the important "advantage of an unvarying pressure throughout. The regulat-"ing valves are opened and closed alternately to allow the steam "to enter either end of the cylinder from the separate vessel, "and are worked by cams or excentrics, or by any of the usual "means; the size of the separate vessel may vary according to "circumstances, being in some instances of the same or even "greater capacity than the cylinder."

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 2.—N° 1920.

TURNER, FREDERICK WILLIAM.—(*Provisional protection only.*) —This invention consists of apparatus for obtaining and applying the motive power of steam, which is admitted at a suitable pressure into one end of a submerged cylindrical shell, mounted concentrically within which there is a shaft of increasing diameter towards the mid-length, where it is furnished with a series of radiating helical blades; "truncated cone pieces" fixed inside the cylinder convey jets of steam to act upon the water in the direction to drive through the cylinder a constant current or artificial stream, which rotates the shaft by acting upon the helical blades When two or more screws or sets of blades are dispose shaft within the cylinder, fixed blades are attached to th

as to project obliquely therefrom between the revolving blades; these fixed blades prevent all circumfluent action of the water and direct it more effectively upon the revolving screws. When used for marine propulsion, the end of the cylinder projects from and opens out of the stern of the vessel; the helical driving blades are disposed round a boss upon the projecting end of the shaft within a ring of the same diameter as the cylinder; and radiating from the periphery of the ring other screw propelling blades are fixed to act upon the open sea water in the usual manner. In some cases, the stream of water after its passage through the cylinder is directed through a turbine wheel, thereby adding to the effective power of the apparatus; and for land purposes a circulation of the water may be kept up, sufficient fresh being added to prevent ebullition.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 3.—N° 1932.

O'HANLON, PATRICK.—This invention relates to steam boilers, and especially to such marine and other boilers as are described, and for which this inventor received provisional protection bearing date June 8, 1861, N° 1463. The present invention relates, (1) to the economical consumption of fuel, and (2) heating feed water. The first consists in introducing a fan into the mouth of each of the longitudinal intermediary large flue tubes, which are supported upon and communicate with the furnace by short hollow necks, according to the said provisional protection; these fans are rotated by the flue draughts, and consequently transmit the smoke more regularly into the smoke box of the boiler; they consist of a series of blades fixed to a central spindle, which rests in bearings attached to the sides of the flue tubes, the shape of the blades being adapted to the form of the internal space. The front mouth of each flue tube is closed, with the exception of small adjustable openings for admitting air to the fans. Second, when the feed water is heated, the fans are omitted in the two side flue tubes, through which the feed pipe is centrally disposed; it enters at the front end of one side tube, passing through and out into the smoke box which it crosses, and enters the back end of the other side tube, and after passing through and out at the front end, is bent downwards and connected to the lower water space of the boiler, communicating therewith through an ordinary valve.

[Printed, 8*d*. Drawing.]

A.D. 1861, August 5.—N° 1939.

MEYER, HERMANN CHRISTIAN.—This invention relates to a mode of working slide valves for regulating and stopping the flow of steam, water, or other fluid, without surface friction; it consists, (1) in fixing on the back of the slide valve, four bearing blocks to receive two transverse shafts; fitted to revolve on the ends of these shafts, are four small flanged wheels, which run on rails fixed in the valve box along each side of the path of the valve; the bearings of the axle shafts are eccentric to the centres of the shafts and wheels; a short lever arm is fixed on each shaft, to which simultaneous motion is given by a connecting rod jointed to the lever arms; the working valve rod is jointed to the connecting rod; its first action is to pull over the short lever arms, thereby rotating the shafts about 90°, which by means of their excentric bearings have the effect of pressing down the wheels, and slightly lifting the slide valve off its facings; in this position, and during the working of the valve, the valve rod is held by a revolving hook bolt, which on being withdrawn, the valve returns to its normal position. 2. This arrangement differs from the first; there is no lifting by eccentric action, the axles are fixed across the back of the slide valve, the wheels on the side rails sustain the pressure, whilst the working surfaces are kept in close contact by suitably formed india-rubber packings placed in grooves, the pressure being regulated by face frames with surfaces a degree out of parallel. These modes of working slide valves are adapted to rotary as well as sliding motion.

[Printed, 8*d*. Drawing.]

A.D. 1861, August 6.—N° 1948.

GALLOWAY, WILLIAM, GALLOWAY, JOHN, and WILSON, JOHN WILLIAM.—This invention relates to vertical and horizontal steam boilers; mode of showing the water level, examining the interiors of boilers, and to safety valves.

1. Vertical boilers are constructed with thin annular chambers attached to the inner casing of the boiler shell, united to thin central chambers by annular groups of short vertical tubes; two furnaces divided by a narrow water space which supports the central chamber, send up their flaming gases against the lowest, which causes them to spread, and then rise between the inner casing of the shell of the boiler and the circumferential surface of

the chamber, coming against the under surface of the first annular chamber which sends the draught towards the centre through the first annular group of tubes; the burning gases here rise against the second central chamber, where they spread, then rise and are turned inwards again, by contact with the second annular chamber, coursing through the second annular group of tubes and so on according to the number of chambers employed, whence they pass into the flue in connection with the chimney. Three modifications of the above arrangement, viz., uniting annular chambers to central chambers by short vertical water tubes, are shown and described.

2. Constructing a short distance beyond the bridge within the flues of a horizontal boiler with two furnaces, two thin vertical water channels or spaces, which are attached to and so project at right angles from the sides of the cylindrical flue, as to leave a narrow upright passage for the flaming gases from both furnaces, there to mingle and pass into the flue, thereby effecting more perfect combustion and consumption of smoke.

3. Forming the bridge with metal plates into a hollow water space, which is connected to the upper part of the flue by vertical tubes, and communicates with the water space above.

4. Fixing two strong glasses to cover openings through the shell of a boiler, and reflecting artificial light therein through one glass, the other being for the eye to examine the state of the interior.

5. Fixing a strong glass plate over a slotted opening in the end of a boiler for discovering therethrough the water level.

6. Relates to safety valves. Admitting the steam to a bent tube, the end of which is connected to the inner side of a ram acting on the lever of the safety valve, connecting two valves to the same weighted lever; the bent tube with the ram above referred to, acts on the weighted lever in the same manner. Applying a water float and wheel in connection with a tap in the bent tube; when the water descends below its working level, the action of the float opens the tap, thereby admitting steam to the ram, which causes the lever to lift the safety valve and the steam to blow off.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, August 8.—N° 1979.

KINSEY, Henry.—This invention relates to steam engines of the oscillating class, to vertical steam boilers, and to governing throttle

valves. The trunnions are placed at the sides of the cylinder bottom, where the slide valve is arranged to work on a plane with the centre of oscillation, at right angles with the direction of the piston rod; the end of the valve rod works, as the cylinder oscillates to and fro, in a fixed groove, so curved that the proper time and motion is given to the valve; the curved groove is formed in a sector shaped lever which centres on one of the trunnions; one half of the length of the groove works the valve for the forward direction of the engine, and the other half for the reverse, the sector being then fixed at either point; elastic tubes composed of india-rubber and canvas, answer for the steam supply and exhaust in small engines, both having a lateral attachment to one of the trunnions. The boilers are constructed with a thin surrounding water space formed between the outer cylindrical shell and the cylindrical furnace, which rises to a considerable height above the fire-bars; a hollow inverted conical water chamber is suspended from the crown of the furnace by short water tubes, which form a communication between the interior of the cone and the general water space; the cone tapering downwards through the fire-bars forms an annular furnace; an external communication and water circulation is kept up through pipes fixed between the apex of the cone and the external water space. The chimney is centrally attached to the top of the furnace, passing through the steam space and out of the crown of the boiler. A modification is shown wherein a double cone which forms a water space is introduced, through which the fire draught openings conduct the flaming gases to the interior, and thence to the chimney. The height of the water level within a boiler is ascertained by means of a float attached to the end of an arm fixed at right angles on the end of a hollow spindle or plug, which passes through the shell of the boiler and is moved round by a handle; when the float touches the water, it opens a small valve at the end of the plug, which allows an escape of steam, the position of the handle then indicates the height of the water. In governing steam engines, to prevent running away when suddenly relieved of their load, a strong voluted spring is fitted within the driving wheel or pulley which runs loose on the driving shaft; the central convolution of the spring is fixed to the shaft, and the outer convolution to the wheel or pulley. When the engine starts, the shaft makes two or more revolutions before the spring tightens to revolve the wheel or pulley, which has a coarse thread or worm

cut on its boss; a nut attached to a sliding block on the shaft is actuated by the worm, so that the motion of the wheel or pulley generated by the uncoiling of the spring when the shaft stops suddenly, causes the block to traverse, and by means of a lever and connecting rod close the throttle valve, which again opens so soon as the strain comes on to the spring.

[Printed, 1*s*. Drawings.]

A.D. 1861, August 14.—Nº 2017.

RIPPINGILLE, Edward Alexander.—This invention is applicable to all jet condensing engines, and is for the purpose of utilizing the power of the injection water as forced by atmospheric pressure into the condenser. It consists in the use of a closed cylinder, having its piston rod coupled to work simultaneously with the strokes of the piston of the air pump; "passages communicating from the valve chest admit the injection "water to one or both ends of the cylinder, and from the cylinder "through the eduction port into the condenser communicating "with valve chest in the supply pipe for the injection water, "which must be of equal area to the area of ports of the engine; "the valve or valves is or are worked by an eccentric, for which "purpose I employ the loose eccentric, which would require no "supervision in reversing the engine. The size of the injection "engine is regulated by the size of the air pump; in single-acting "engines the diameter of the injecting engine should not be more "than half the area of the air pump; in double-acting engines, "one-fourth the area. The valve ports and eduction passages "must be in size in proportion to the speed of the engine, from "one-fourth to one-tenth the area of the injection cylinder." The injection cylinder should be placed near the condenser and in superposition thereto, in order that the water may have free passage. In marine engines, the injection cylinder where practicable may be placed over the air pump, so that the two pistons can be coupled together to work in a vertical line.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 17.—Nº 2050.

COLBURN, Zerah. — (*Provisional protection only.*) — This invention relates to heating feed water and feeding steam boilers. A supplementary engine and boiler working at a pressure of 200 lbs. per square inch are required; the exhaust steam from

the engine is discharged into a receiver where it is partially condensed, a pressure always remaining in the receiver of 52 lbs. per square inch; this pressure without the aid of pumps will force the condensing and condensed water into the main boilers, working at a pressure of 40 lbs.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 19.—N° 2056.

SELBY, GEORGE THOMAS.—This invention relates to the construction of surface condensers. A number of tubular spirals are vertically and closely arranged within a steam-tight rectangular condenser case; both the upper and lower ends of all the spiral tubes are screwed and bent in one parallel direction, for the purpose of being fixed through one side of the condenser case by means of nuts inside and out, with intermediate india-rubber washers; by this arrangement all the lower ends so range in horizontal line, that a steam-tight narrow chamber fixed along outside will embrace or enclose them, and another chamber fixed high up along the same side of the case, encloses all the upper ends of the spiral tubes. The stream of cold condensing water enters by a pipe at the bottom, and after passing through the condenser case amongst the spirals, is carried off by a double-branched discharging pipe near to the top. The steam enters by a pipe into the upper-side chamber, and is condensed in its downward passage through the spiral tubes; the water of condensation after flowing into the lower-side chamber, is discharged through a pipe connected with an air pump; the form of the condenser case is not material, it must be adapted to the locality of its use. The process of condensation may be made to take place within the condenser outside the spiral tubes, in which case the condensing water is made to take its course through the side chambers and the tubes. The precise form of the tubes is not material, they may be voluted or waved, but so fixed through the case side that their upper and lower ends open into their respective side chambers.

[Printed, 10*d*. Drawing.]

A.D. 1861, August 20.—N° 2062.

HARGREAVES, BENJAMIN, and HARGREAVES, JOHN.—(*Provisional protection only.*)—This invention relates to valves of

steam engines. Instead of regulating the feed of steam to the cylinder by the end of the valve flange, it is fed through a transverse slot in it, the area of the slot or passage being made proportionately larger in order to admit of a larger exhaust; the excentric is altered to increase the speed of the valve at each end of the traverse of the piston, by working the connection on two circles.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 23.—N° 2108.

ELSON, SAMUEL.—This invention relates to heating the feed water of steam boilers, superheating, and surface condensing steam. The feed water is first injected into the exhaust steam pipe in communication with the condenser, whence, together with the water of condensation, it is forced through a main pipe into a double range of vertical cylinders placed in the chimney flue; distributing branches from the main enter the top of each cylinder, reaching to within a short distance of the bottom, where the water is discharged and heated as it gradually rises towards the tops of the cylinders, which are in communication with the boiler; a chain is coiled round each cylinder and attached to a wheel at the top and bottom of each, which by revolving at a uniform speed, remove all sooty adhesions from their external surfaces. The same kind of apparatus is used for superheating, with the addition of a syphon placed at the lower ends of the cylinders, and an iron casing, wherein is a lever with float and balance weight, an equilibrium valve, and an air valve suitably arranged to carry off lodgment water and retain the steam. The apparatus may be also made applicable to surface condensing, in conjunction with an iron casing or receptacle, through which the exhaust steam may be blown, the cold water being in the cylinders; or the exhaust steam may blow into the cylinders, with the cold water surrounding them.

[Printed, 8*d*. Drawing.]

A.D. 1861, August 23.—N° 2113.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from William Lane Chase.*)—This invention relates to additional apparatus in combination with the "Giffard injector," whereby water can be raised by the apparatus from a greater depth below its

level than heretofore. The object is, 1st, to effect this by "com-
"bining a Giffard injector and the suction pipe thereof with a
"valve located in the said suction pipe, in such a position that it
"prevents the reflux of the water from the suction pipe when the
"steam is shut off from the apparatus."

2nd. "To permit the suction pipe to be filled with water up to
"the end of the steam nozzle, so that when the steam jet is put
"in operation it shall begin to act immediately upon dense water.
"This part of the Invention consists in combining the Giffard
"injector, the suction pipe thereof, and the reflux valve before
"mentioned with a filling nozzle fitted with a cock or valve, the
"combination being such that the suction pipe can be filled
"through the cock or valve at the nozzle, which is to be closed
"when the suction pipe and nozzle are full."

3rd. To procure a supply of water for filling the suction pipe by the operation of the injector; "consists in combining the second
"part of this invention with a tank by means of a branch pipe
"leading from the discharge pipe of the injector, which branch
"pipe is fitted with a cock or valve, so that the tank may be
"replenished with water by the injector itself."

[Printed, 8*d*. Drawing.]

A.D. 1861, August 26.—N° 2130.

ATTWOOD, HENRY.—This invention relates to cleansing and feeding steam boilers, which is effected by removing the scum from the surface of the water and drawing off the sediment at the bottom. Two pipes which extend nearly the whole length of the boiler, united by short pipes at each end forming a parallelogram, are suspended inside the boiler a little below the water level; these pipes are perforated at regular intervals in a line along their upper surface, into which the short hollow stems of shallow dishes are fixed; a central branch from the front end, communicating with the outside of the boiler, is furnished with a blow-off cock, through which as the scum accumulates in the dishes it is drawn off. A conduit or trough is fixed along the bottom of the boiler to remove sediment in the same way, and the feed pipe is perforated at intervals and laid along the bottom, so that when the boiler is feeding, the lower water shall, through the whole length, be kept in a state of agitation. The use of chemical agents is sometimes necessary.

[Printed, 10d. Drawing.]

A.D. 1861, August 27.—N° 2131.

COLBURN, Zerah.—(*Provisional protection only.*)—This invention relates to supplying compound steam engines or separate engines working high and low pressure steam, with pure high, and mixed low pressure steam raised in separate boilers; hitherto in compound high and low pressure engines, the same high-pressure steam expanded in and exhausted from the first cylinder has passed into a low-pressure cylinder and thence to the condenser. According to this invention, very high-pressure steam is raised in one boiler and ordinary low-pressure steam in a second boiler; the high-pressure steam raised to a pressure of from 70 to 250 lbs. or more per square inch, is worked expansively or otherwise in a high-pressure cylinder or separate engine, which exhausts into a receiver or into a low-pressure cylinder, and during its passage a portion of the steam raised in the low-pressure boiler is admitted to mix therewith. The portion of steam worked twice over, may bear any proportionate ratio to the whole of the steam worked in the low-pressure cylinder or engine. The high-pressure steam may be superheated before use in the high-pressure cylinder, or after its escape therefrom. A portion of the high-pressure steam may be used to heat feed water to such a temperature as will insure its admission into the low-pressure boiler without the aid of a pump.

[Printed, 4*d*. No Drawings.]

A.D. 1861, August 31.—N° 2171.

TAYLOR, Peter.—This invention relates to apparatus for removing sediment and preventing incrustation in steam boilers. It consists in the use of metal pipes cast with a line of slots along their whole length. For removing scum two or more of these pipes are placed with their slotted side upwards in a boiler a little below the water level; they are connected inside the boiler, have one outlet united to a valve, and are made to discharge suddenly by half a turn of the spindle. The sediment is removed from the bottom of the boiler in the same manner, the line of slots in one or more pipes being placed downwards; the collective area of the slots should be greater than the area of the valve, which may be arranged to operate the scum pipes, as well as those at the bottom which carry off the sediment, by the use of a connecting pipe inside the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1861, September 5.—N° 2207.

ROWAN, John Martin, and HORTON, Thomas Rogers.—This invention relates to steam boilers and surface condensing, combined with supplying marine boilers with fresh water. "The "improvements in boilers are comprised in a modification of the "'compound subdivided' class of boiler described in the Speci-"fications of British Letters Patent granted to the present "patentees, and dated the 19th April 1858 (N° 856), and the 8th "February 1860 (N° 332)." The boiler consists of a series of transverse hollow frames placed side by side; each frame is fitted with a double row of vertical water tubes, which reach from and are set into the inside top and bottom plates, so that there is a free circulating communication within the tubes and hollow casing of each frame, which towards the front end of the boiler are shaped to form two furnaces. Three large longitudinal tubes, each the length of the boiler, are placed parallel to each other underneath, communicating with each frame by a short branch; these tubes receive the feed water and circulate it through the series; rising from the top of each frame there are two branch pipes arched over towards each other, these are attached to and support a steam cylindrical chamber which extends longitudinally over the whole series, and communicates by external pipes with the large tubes underneath. Steam domes are mounted on the cylindrical chamber. The improvements in surface condensers consist:—1st, in coating that surface, either external or internal, of iron or steel tubes, which is exposed to the corrosive action of sea water, with copper or other metal, or alloy, which does not corrode or oxidize; also coating all other parts of surface condensers which are not made wholly of copper or non-corrosive alloy; soft solder is used for covering the ends of tubes; those parts of metal condensers subject to decay from the same cause are protected in a similar manner. 2. Consists of providing an exit for the sea water in surface condensers, by means of a narrow slit or opening round the tube chamber, whereby the water passes off in a uniform current on all sides. 3. Consists in holding the tubes in the holes of the tube plates of surface condensers, by means of a slit tapering caoutchouc ring and a wedge-shaped metal flanged ferrule pressed up by a stop plate.

[Printed, 10*d*. Drawing.]

A.D. 1861, September 6.—N° 2222.

MENNONS, Marc Antoine François. — (*A communication from Bernard Palazot.*)—This invention relates to smoke-consuming furnaces, whereby a due proportion of oxygen from air or steam is admitted and mingled with the fuliginous products of combustion, which consume without waste or emission of smoke The air or steam is admitted through a regulating flap valve, which covers an opening at the end of the ash-pit; this opening terminates in a narrow passage up through the centre of the bridge; the fire draught is kept down so as to sweep closely over the top of the bridge, by a vaulting of refractory fire-brick, thereby ensuring a perfect combination of the air or steam entering through the narrow passage with the fuliginous products of combustion passing from the furnace, which ignite by contact with the fire-brick vaulting, and are consumed in the flues; the flap valve is under the control of the fireman, who, by means of a connecting rod and handle, regulates the admission of air and steam.

[Printed, 6*d*. Drawing.]

A.D. 1861, September 6.—N° 2230.

RUSSELL, John James.—This invention relates to preparing the ends of welded boiler tubes previous to their being fixed in plates. " For these purposes, in order that the ends of welded " iron tubes, which are used in the construction of the flues of " tubular boilers and for other purposes, may be more uniformly " and advantageously annealed, in order that such ends may be " expanded and caused to fit the holes in the plates in which, " they may be applied, I, in place of heating them as heretofore, " employ a bath of fluid lead or other suitable metal or alloy, into " which the ends of the welded tubes are immersed, and by this " means they are readily and very uniformly heated to the extent " desired, which cannot be the case when a fire is used. The ends " of the tubes having been immersed in the fluid metal bath to " the extent desired and heated thereby, are then forced into " powdered coke, or charcoal, or sand, or other suitable matter to " exclude the atmosphere whilst the ends are becoming cooled."

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 9.—N° 2250.

JOHNSON, John Henry.—(*A communication from Paul Baudet.*) —(*Provisional protection only.*)—This invention relates to steam boiler and other furnaces, also to domestic fire-grates. It consists in so arranging the grate bars of furnaces, that by means of suitable levers and counterweights a rising and falling motion is imparted to each alternate bar. In locomotive furnaces the fire-bar surface is transversely divided; the bars composing the front half incline downwards from the furnace door, and by means of a movable bearer rail, each alternate fire-bar in the front range is, by mechanical means, made to rise and fall, whilst the intermediate bars remain fixed; the back half range of grate bars, which are disposed across the furnace, are agitated with up-and-down motion by the same mechanism. In some furnace arrangements the fire-bars rest upon a central transverse bearer rail, upon which the bars are made to rock or oscillate, and in other furnaces a longitudinal sliding motion is imparted to the bars by suitable mechanism.

Domestic grates also are made to rock or oscillate on side pivots placed so much before the centre of gravity, that the grate after being depressed two or three times in front, and allowed each time to fall back against a resting stop, will have the loose dust and spent ashes shaken out by the slight concussions.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 10.—N° 2255.

ANTHONY, John.—This invention, relating to steam boilers and generators, consists in continuing the smoke chambers, flues, and tubes of steam boilers, up to or near to the top of the boiler shell, and in dividing the smoke chambers, flues, and flue tubes into divisional groups by diaphragms or water space partitions, so as to compel the flaming gases which rise from the burning fuel to pass successively from back to front of the boiler, or from side to side, until the whole of the heating surfaces have been traversed before the hot draught is allowed to pass to the uptake and chimney; the upper tubes act as superheaters within the upper section or steam space of the boiler. The flues or tubes may be increased or diminished in each section or group, in order that their united area may be proportioned to the speed of the draught.

The superheating power of the boiler is to be regulated by raising or lowering the working water level.

[Printed, 10*d*. Drawings.]

A.D. 1861, September 11.—N° 2258.

BARRÉ, LEON PIERRE.—This invention relates to tubular boilers, being improvements on former Letters Patent granted to this inventor, February 3rd, 1860, No 279. Consists, 1st, in securely closing the joints between the tubes and orifices of the tube plates in which they are fixed. The holes in the tube plate at the back of the furnace or fire-box must be of the same diameter as the tubes, but the holes in the tube plate at the smoke-box end, must be about one-seventh of an inch larger than the tubes; a metallic ring is soldered on near one end of the tube, and hempen packing saturated with white lead, or an india-rubber ring is placed round the extreme end, so that when the tube is forced into the tube plate from the inside, a squeezing of the packing takes place between the edge of the metallic ring and the inside of the tube plate. The other end of the tube is furnished with a metallic packing ring, on which there is an annular groove filled with hempen packing and white lead; flanged ferrules are then forced into both ends of the tubes from the outside, by means of a long scerw rod and nut placed inside the tube, the head of the rod acting against the ferrule at one end, and the nut, when turned, against the ferrule at the other end, until their flanges abut against the tube plates, which completes the operation. 2nd. The taking out and replacing the tubes separately is effected, first, by means of a mandrel acting as a spring, by which the ferrules are withdrawn, and then by means of a drift or punch, of two diameters corresponding with the external and internal diameters of the tubes, which operates to remove them by the aid of a hammer or screw; when the drift is driven into a tube the shoulder, formed by the two diameters, abuts against its end, a smart blow or two will then dislodge the tube; the drift is also used for "fixing up" the tubes in the plates.

[Printed, 8*d*. Drawing.]

A.D. 1861, September 16.—N° 2305. (* *)

HESKETH, WILLIAM JUXON, and PARSELL, DAVID.—(*Provisional protection only.*)—" Improvements in steam boilers " and furnaces."

The furnace is completely surrounded by water pipes, and the fire-bars are made hollow to contain water; the fuel for supplying the furnace is first placed in a chamber or "roaster," which revolves within the furnace, and from which the carbonized coal falls on to the fire. The air is heated before being passed into the fire-grate.

[Printed, 6*d*. Drawing.]

A.D. 1861, September 17.—N° 2321.

LEE, JOSEPH, and TAPLIN, BENJAMIN DUTTON.—This invention relates to the construction of traction engines. An ordinary locomotive boiler is employed; the fire-box forms the fore end, before which supported by the front wheels there is a platform, whereon the driver and steersman stand. The axle of the hind or driving wheels is below the cylindrical part of the boiler, and the crank shaft which is driven by a pair of cylinders, contained in the upper part of the smoke box, is placed above the boiler directly over the axle. On one end of the crank shaft there are two loose pinions of different diameters, which when desired can be made fast respectively by means of a peculiar form of clutch, operated by the driver. On the axle of the driving wheels are two spur wheels of suitable diameters, gearing into the two different sized pinions, whereby differential speeds for the driving wheels are obtained. The leading wheels turn on pins or short arms projecting laterally from vertical axes, supported in suitable bearings attached to the end of a cross bar, and by means of lever arms and connecting rods are simultaneously directed by the guiding apparatus in the desired direction. A screw passes vertically through the centre of the cross bar, whereby the end of the boiler may be raised or depressed, so as to maintain a horizontal position, whilst ascending and descending inclines. The usual appliances of safety valve and gauges are comprised in the general arrangement.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, September 18.—N° 2329.

BEER, ALFRED JAMES.—(*Provisional protection only.*)—This invention relates to "valves of steam and other motive engines" whereby the steam pressure on slide valves and the friction on their working surfaces is reduced. It consists in "constructing on the

" back of the slide valve, a shallow cylinder, which communicates " with the interior of the exhaust port of the valve by means of a " small hole. In this cylinder is fitted a piston, which is secured " to the face of the back plate, and is provided with suitable " metallic or other packing, so as to form a steam-tight joint in " the shallow cylinder. The face of the back plate rests upon " antifriction wheels or rollers, which are placed by the sides " or ends of the valve in the steam chest. Steam being admitted " to the steam chest, will act with the same pressure on the back " of the back plate, as is due to the area of the piston in the " shallow cylinder, and the back plate being supported on the " antifriction rollers, and properly balanced in the steam chest, " the friction of the working parts or faces of the valve and ports " will be considerably diminished." Two or more shallow cylinders may be fitted on valves of large size, and any convenient number of antifriction rollers employed.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 21.—N° 2364.

FENTON, James.—(*Provisional protection only.*)—This invention for causing the water to circulate in steam boilers consists in imparting an extra amount of heat to certain portions of the water at an intermediate point between the water level and the boiler bottom. The upper part of the fire-bridge is formed by a metal box or vessel, capable of bearing a steam pressure equal with that in the boiler, with which it has a high and low level communication; the flaming gases not only pass over the hollow bridge or vessel, but through it also by means of tubes and hollow stays. By these means a high degree of heat is imparted to the water in the vessel, which " by a well known law " flows upwards through the high level communication to the upper region of the boiler, whilst constant circulation is kept up by supplies of water from the bottom of the boiler through the pipe communicating therewith.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 25.—N° 2389.

MUSGRAVE, Joseph.—(*Letters Patent void for want of Final Specification.*)—This invention, relating to " the application of " steam power," entirely dispenses with the large first motion

wheels, fly wheels, heavy foundations, and large engine house now required. It consists in the use and application of two or more small cylinders placed to work in a vertical, horizontal, or diagonal position, direct on to the main crank shaft, or on to a second motion shaft.

[Printed, 4d. No Drawings.]

A.D. 1861, September 25.—N° 2392.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Isidore Duballe.*)—This is an invention of apparatus for letting off water from steam cylinders, and admitting lubricants thereto; they may be combined or used separately. For the water escape a tube is screwed into the cylinder near the end; this tube opens through another tube into a spherical chamber, in the bottom of which there is a plunger valve, kept in position to allow an escape of water by a helical spring. The top of the valve within the chamber is in the form of a cup, into which the end of the tube enters leaving free space below. The valve is closed by the force of steam in the cylinder during the stroke, but opens when the cylinder exhausts; the escape of water then takes place. Each end of the engine cylinder is furnished with an escape for the water of condensation.

The apparatus for admitting lubricants to the cylinders consists of a cup closed at the bottom by a screw valve, communicating when open with a spherical or other formed chamber, into which two tubes enter; these tubes communicate with the cylinder. The end of the larger tube is turned up within the chamber, and the end of the smaller tube is turned down, reaching nearly to the bottom. When put in operation the cup is filled with the lubricant while the valve is open, which allows the liquid to flow into the chamber; the valve is then screwed down. On steam being admitted above the piston it enters the chamber through the larger pipe, and by pressure on the liquid surface of the lubricant forces a limited quantity of it up through the smaller pipe into the cylinder at each stroke of the piston.

[Printed, 6d. Drawing.]

A.D. 1861, September 28.—N° 2426.

LANE, DENNY.—This invention relates to apparatus for regulating the passage or flow of fluids. It consists of a "brake and

"tappet motion," subject to the varying speed of a governor, which when running either above or below the established or mean working speed, acts correspondingly by means of suitable connections, so as either to close or open the throttle or other valve supplying steam to an engine. Fixed upon a horizontal spindle is a tooth wheel, which obtains intermittent motion from a lever arm, the free end of which, by means of an eccentric connected with the engine, is kept in constant vibratory motion. The other end of the lever arm is slit up, and embraces two semicircular wooden brake blocks or shells, which close round the spindle and actuate it by friction, which is regulated by a screw on the lever arm. On each side of the spindle near to the edge of the wheel are two upright standards, to which the ends of two pawl catches are jointed; the other ends of the pawls point to each other over the wheel. Mounted upon a fixed stud over the centre of the wheel at right angles with the spindle is an oscillating lever, which, equidistant from its centre on each limb, carries two small connecting rods, which are jointed respectively to the free ends of the pawls underneath; this lever is so acted upon by the governor that while the engine continues to run at its proper speed it remains in a horizontal position, and both pawls are kept clear of the wheel, which, actuated by the friction arm, continues to move backward and forward underneath; but so soon as the engine is accelerated, or falls below its normal speed, then by the action of the governor the corresponding limb of the lever is depressed, and the pawl connected thereto is lowered upon the teeth of the wheel; in this position, being heldby the pawl, the wheel can only move in one direction, which being repeated by the next movement of the arm causes the spindle intermittently to revolve, and by suitable connections so operate the throttle valve as to bring the engine back to its normal speed, when the lever again assumes its horizontal position pending the next irregular movement of the governor.

According to the applications of this brake and tappet apparatus so are the details modified and changed. Descriptions are given in respect to gas engines, steam boiler dampers, feed water valves, injection water to condensers, including a "gas supply "governor," in connection with the invention.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1861, October 2.—N° 2450.

HESFORD, JAMES.—(*Provisional protection only.*)—This invention, relating to steam engines and valves, consists in working the slide and other valves of engines by means of a double lever connected to the piston rod and to the valve spindle, thereby dispensing with the excentric; also fixing a taper plug to a screwed spindle which works through a stuffing box. To open or close the valve the spindle is turned, the plug is partially lifted or pressed into the socket, whereby all impurities adhering to the valve are removed.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 2.—N° 2455.

DAVIES, JAMES, and EVANS, THOMAS.—This invention relates to the construction of engines with oscillating cylinders, and consists of peculiar forms and arrangements of valves, which are operated by the oscillations of the cylinder, and in the mechanism by which these valves are regulated. Two kinds of valves are used; the one in common use is an ordinary slide valve fitted within one of the trunnions; it is operated as the cylinder oscillates by means of a bowl upon the valve spindle working in a fixed guide. The other proposed for use is a fixed circular valve; the ports are so arranged that while one port is over a corresponding port in the cylinder the other is upon the blank face of the valve surface, and "vice versa;" a sunken portion of the valve face places the exhaust in communication with each steam port. Reversing gear is arranged to each description of valve.

[Printed, 8*d*. Drawing.]

A.D. 1861, October 2.—N° 2457.

COFFEY, JOHN AMBROSE. —(*Provisional protection only.*)—This invention, relating to steam and other engines for obtaining rotary motive power, consists of a central hollow axis from which radiate a number of pipes; the outer ends of these pipes are suitably furnished so as to open at their extreme ends, all in one direction at about right angles with the radial line; these ends abut against, and work air-tight within the inner surface of an "annulus" concentrically fixed on the same plane as the radial pipes. When steam, air, or other fluid is admitted to the central axis, it

diverges respectively through the radial pipes to their furnished ends, where it strikes at an angle against the "fixed annulus," and so acts by repression upon the ends of the pipes, as to cause the axis, which is suitably stepped and supported, to revolve. The invention may be modified by causing the "annulus" to revolve round a suitably fixed circumposed series of pipes; also, instead of the steam or fluid being admitted at the centre, it may act from the "annulus," in which case only the extreme angular ends of the need pipes be hollow.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 3.—Nº 2463.

DICKINSON, John Charles.—This invention relates to the particular disposition and arrangement of the various parts of compound steam engines. The high-pressure cylinder and the low-pressure cylinder are placed near each other, or may be cast together. The centre of the air pump, which is below the condenser, is placed on a line with the centres of the two cylinders; the piston rod of the low-pressure cylinder, which is about four times the area of the high-pressure cylinder, works verticaliy direct upon a cross pin, fixed at the end of an oscillating beam which vibrates on a centre pin at the other end, fitted in blocks which slide in a bracket fixed to the engine frame or the wall side; the length of slide is limited to the length of the versed sine of the arc which would otherwise be described by the path of the centre of the pin at the outer end of the beam, to which the low-pressure piston rod is coupled. The high-pressure piston is fitted with a trunk; the lower end of the connecting rod is united to the piston by a ball and socket joint, its upper end is jointed to a cross pin fixed in the beam at a distance from the low-pressure piston, equal to about $\frac{2}{9}$ths of its whole length; the centre of the air pump piston rod, which works through the condenser, comes about the mid-length of the beam, it is furnished with a crosshead connected to radius rods for giving parallel motion thereto. The main connecting rod whlch gives motion to the crank shaft, is coupled to a cross pin in the beam about midway between the cross pins of the two piston rods. The steam first operates the piston in the high-pressure cylinder, which exhausts through suitable passages into the low-pressure cylinder.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, October 7.—N° 2502.

STOTHERT, GEORGE KELSON.—This invention relates to surface condensing apparatus, also applicable to heating feed water for high-pressure boilers. A cylindrical vessel is surrounded by a jacket; the vessel is filled with longitudinal tubes fitted into tube plates, situated so as to leave a chambered space at each end of the vessel; one of the tube plates is fixed, the other has liberty for expansion, and is made water and steam tight by packing and an annular gland tightened up with bolts and nuts. The steam to be condensed is conveyed therein through the side of the vessel, it is condensed by contact with the external surface of the tubes; the condensing water enters one of the chambered ends, and after passing through the tubes is discharged at the other. The condenser may be worked under opposite conditions, the steam being made to pass through the tubes and the condensing water between them within the vessel. When both tube plates are fixed in the vessel, each tube by means of a pressing roller worked inside it near the ends, is made to swell into the form of a projecting ring; there is a corresponding annular hollow inside the tube, to which a longitudinal power of expansion and contraction is imparted at the part so operated upon. The outside casing of the cylindrical vessel may be made to yield to expansion by means of a projecting expansion ring formed out of sheet metal. When used as a condenser to a condensing engine, the apparatus is disposed in connection with an air pump. Heated feed water for high-pressure boilers is obtained by forcing such water through the tubes on its passage thereto, and blowing the exhaust steam through the body of the apparatus.

[Printed, 10*d*. Drawing.]

A.D. 1861, October 10.—N° 2536. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from Francis Bowes Stevens.*)—" An improved apparatus for heating the feed " water of steam engines."

This invention consists in " first, the combination of additional " eduction valves opened and closed in a regulated period of " *time* . . . with a heater communicating with the cylinder by " *the additional* valves, but closed against the atmosphere, and " *with a pump* or its equivalent for withdrawing the water from

"the closed heater. Secondly, the combination above mentioned "in combination with a pump for ejecting water into the heater. "Thirdly, weighting the delivery valve of the pump that injects "the water into the heater. Fourthly, the combination of the "additional eduction valves, injection pump, and closed heater "with a lifting withdrawing pump. Fifthly, the combination of "the additional eduction valves, injection pump, and closed "heater with a plunger pump having a valve placed in the hollow "plunger, and having the plunger packed by two stuffing boxes. "Sixthly, retaining the additional eduction valves on their seats "when the pressure of the steam on them is alternately in opposite "directions. . . . . Seventhly, the use of an additional eduction "valve communicating with the cylinder of a steam engine by an "aperture placed at or near the middle of the length of the cylin-"der, in combination with apparatus for heating the feed water "of steam engines by steam withdrawn from the induction side of "the piston. Eighthly, forming the aperture last named by a "number of small holes pierced through the middle of the cylinder. "Ninthly, opening and closing the additional eduction valve "when placed in the middle of the cylinder by a motion derived "from the excentric that works the main valves of the engine. "Tenthly, the use of the diaphragm in the closed heater, and "the valve attached to the cup or its equivalent, and balanced by "the weight, in combination with apparatus for heating the feed "water of steam engines by steam withdrawn from the induction "side of the piston. Eleventhly, I claim forming the additional "eduction valve openings on the sides of a slide valve and its "seat, and arranging them so as to be wide open when the valve "is midway in its throw, and also so as to lead to an aperture "made in the cylinder at or near the centre of its length. "Twelfthly, I claim forming the additional openings last men-"tioned in a separate valve chest, and then keeping the valve on "its seat by the full pressure of steam from the boiler on the top "of the valve. Thirteenthly, I claim making the withdrawing "pump larger than the injection pump."

[Printed, 2*s*. Drawings.]

A.D. 1861, October 10.—N° 2537.

PAYNE, WILLIAM, and BURGUM, JOHN.—(*Provisional protection only.*)—*This invention*, relating to "packing for engines

"and machinery," consists of sponge cut up into very fine particles mixed (in about the following proportions) with 2 ounces of melted zinc mixed with 2 ounces of mercury, to be pulverized when cold; pulverized Devonshire lead ore, 4 ounces; and flour of brimstone, 2 ounces; these ingredients to be mixed and thoroughly amalgamated. The particles of sponge, after being soaked in grease, are mixed up with the metallic composition which is absorbed by the sponge; the grease is then squeezed out, and the remainder rammed into cotton or other casing. The above quantity of amalgamated powder will require about 4 ounces of sponge, but all the proportions given will admit of some variation.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 11.—N° 2543.

NEWTON, WILLIAM EDWARD.—(*A communication from Francis Bowes Stevens.*)—This invention relates to condensing apparatus for steam engines; it consists in combining the ordinary mode of surface condensing (whereby the exhaust steam after leaving the cylinder is condensed by contact with cooled metallic surfaces, the water of condensation being sent back to the boiler), with the mode which cools the water from the hot well by contact with cooled metallic surfaces, for the purpose of being again used as condensing water by injection. The novel operation is as follows:—The exhaust steam from the cylinder is partially condensed, by first passing through the tubes of an external condenser placed between the side pipes of the ordinary condenser; the remaining uncondensed steam and the water of condensation pass on to the ordinary condenser, where the remaining steam is condensed by injection water from the cooler in the usual manner. By this combination, the inventor states, he "is enabled to use only those "portions of the external condenser and of the cooler that are "most energetic in their action, and thus to condense the steam "of a steam engine by a less amount of surface than would be "necessary if either plan were employed singly."

[Printed, 8*d*. Drawing.]

A.D. 1861, October 12.—N° 2551.

HUGHES, EDWARD THOMAS.—(*A communication from Ernest Louis Pichio.*)—(*Provisional protection only.*)—This invention

relates to a compound for preventing the incrustation and sediment of calcareous matters in boilers; it consists of :—

Alum - - - - - - -	25 kilos.		
Salts of soda at 32° - -	25	,,	
Red ochre - - - - - -	2	,,	
Sulphuric acid - - - -	3	,,	500 grammes.
Brown fecula of potatoes -	15	,,	
Distilled water - - - -	35	,,	

"The alum, salts of soda, and ochre are mixed together after " bring well pulverized separately. The distilled water is poured " into a suitable vessel, adding the brown fecula so as to make a " paste of it, which is then heated to the boiling point, the acid " is added, and the boiling continued till the matter becomes " perfectly liquid, after which the whole is run into another vessel " to cool; the mixture of alum, salts of soda, and ochre is then " added and stirred up till the substances are well amalgamated." The quantity of this compound to be put into each boiler will vary according to its size and the quality of the water used.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 14.—N° 2558.

MACNAB, William.—This invention relates to marine steam engines and boilers of the class described in a former Specification of Letters Patent granted to this inventor, bearing date 26th September 1860, N° 2341. The present invention comprises an arrangement in which, instead of four cylinders there are only two, namely, one high-pressure cylinder which receives the steam from the boiler, and one low-pressure cylinder of larger size, in which the steam operates after acting in the high-pressure cylinder. The cranks acted upon by the two pistons are disposed upon the shaft at right angles to each other. The high-pressure cylinder receives steam through a piston valve, operating in a cylindrical case within a chamber disposed between the cylinders, and so extended as to enclose the high-pressure cylinder which exhausts therein, whence the steam passes through an ordinary slide valve into the low-pressure cylinder and afterwards to the condenser. All the parts are enclosed in jackets, to and from which the inlets and outlets are so placed as to ensure a uniform circulation of the steam within. The cylinders may be arranged in any convenient

position; they may be inverted, with the surface condenser placed beside the high-pressure cylinder, and the air and current pumps disposed against the low-pressure cylinder and worked by a lever connected to the piston head. Other arrangements of the cylinders and parts are described.

The boiler is square at bottom, which is surrounded with water space, and contains two sets of fire-bars divided from front to back by a fire-brick partition, which reaches up within a few inches to the bottom of a semicircular horizontal water chamber, which communicates back and front with the surrounding water space; the top of this chamber is a tube plate, it slightly slopes downwards from the centre on each side, which gives the water tubes fitted into it an outward inclination; the corresponding tube plates, which receive the upper ends of the tubes, are inclined in the same way, so that the inclining tubes enter both top and bottom plates at right angles. The flaming products of combustion rise from each furnace against the horizontal chamber, and pass up between it and the sides of the furnace; the draughts then respectively take an inward course through the thick groups of inclining tubes and meet in the centre, whence they pass up through a series of vertical tubes through the steam space into the chimney. The upper part of the boiler is hemispherical, with a range of vertical stays on each side. Modifications are shown and described.

[Printed, 1s. 4d. Drawings.]

A.D. 1861, October 15.—Nº 2569.

NEWTON, William Edward. — (*A communication from Francis Bowes Stevens.*)—This invention, relating to surface condensing apparatus for those steam engines which return the water of condensation to the boilers without mixing with other water more impure than itself, consists, 1st, in the use of rectangular metal plates horizontally packed above each other a short distance apart by means of packing strips, so that every alternate between space shall form a clear passage for exhaust steam, say, from north to south, whilst the intermediate spaces shall form passages for the flow of condensing water from east to west, the two currents crossing in the separate passages at right angles. The cooling plates are made by preference of cast iron or lead stiffened with antimony. When done mechanically, the cooling

water is driven through the condenser at a high speed, by means of a rotary or centrifugal pump; 150 feet per minute should be the minimum speed up to 650 feet and beyond as a maximum. Two or more of these condensers may be combined, and used in connection with an ordinary injection condenser. 2. When used for cooling condensing water, such water is made to flow through several of the rectangular passages successively; whilst in the cooling water passages there is an independent current in each. 3. Placing suitably formed guide plates in the pipes which convey cooling sea water to the passages, for the purpose of equalizing and conducting its rapid flow thereto. 4. Fixing plates or blocks between the mouths of the rectangular passages, so formed as to divide the cooling water into separate free currents. 5. Supplying sea water for cooling purposes to condensers through apertures in a ship's side, arranged in diagonal line one below the other, in order not to weaken the side of the vessel, and forming similar apertures further abaft, for the discharge of such water after it has passed through the condenser. 6. The so arching the conduction and discharge pipes which convey sea water to and from the condenser, that a portion of such pipes shall be above the sea level, in order that the condenser may be accessible without the interposition of a valve or stop-cock.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1861, October 17.—N° 2588.

WILD, THOMAS, and HODSON, THOMAS.—This invention, relating to an arrangement for heating feed water for steam boilers, consists in so placing in the return flue, or in the flue between two ordinary boilers, a cylindrical tube, that the hot draught and products of combustion shall play over its external surface, its interior being an intermediate passage for feed water between the reservoir and the boilers, with which by branch pipes it communicates; a regulating stop-cock is interposed in each branch to govern the amount of feed. Communications through back pressure valves are opened between the heating tube and the steam space in the boilers (whenever a superior pressure of steam generated in the heater overcomes the ordinary pressure in the boilers) by means of a longitudinal pipe placed over the heater, level with the tops of the boilers, on vertical connecting tubes in which the water level is established.

[Printed, 10d. Drawing.]

A.D. 1861, October 17.—N° 2589.

MERRITT, THOMAS EDWARD.—This invention of "apparatus "for obtaining motive power" relates to a description of steam engine in which reciprocating motion is given to the cylinder whilst the piston remains a fixture. Within the piston rod there are two longitudinal passages which open at opposite sides of the piston; these passages communicate externally with an ordinary slide box and valve. The cylinder, which gives off the motion, works between slides; the central length which works upon the piston is of small diameter, whilst a large area denotative of the power, is given internally to the cylinder ends which expand in conformity therewith. The action may be either vertical, horizontal, or at an oblique angle. The cylinder may be enclosed in a steam jacket, supplied with fresh steam from the boiler or by the exhaust steam.

[Printed, 10*d*. Drawing.]

A.D. 1861, October 18.—N° 2598.

HOLT, CHARLES HERBERT.—This invention, relating to steam engines, pistons, pumps, boilers, and regulating valves, consists, (1) in fixing an inverted vertical high-pressure cylinder of small diameter upon a cross frame supported by side pillars, which are attached to a base plate whereon a low-pressure vertical cylinder is centrally fixed in vertical line underneath. Between the two cylinders there is space for the up-and-down movements of a sliding frame, which acts in vertical guides fixed to the side pillars. The piston rod of the lower cylinder is fixed to the lower cross bar, and that of the upper cylinder to the top cross bar of the sliding frame, to which also the connecting rod is jointed; the central opening in the frame is sufficiently large to allow the crank throw, to which the other end of the connecting rod is coupled, to revolve, and also to clear the crank shaft at each end of its action. The steam, after operating expansively in the high-pressure cylinder, exhausts into the low-pressure below and thence to a condenser.

2. Chamfering or bevelling those parts of the inner faces of the top and bottom plates of pistons which form the annular groove for the packing rings, the sides of which are also bevelled to correspond; compressed helical springs are placed round at regular intervals between the rings, the effect of which, in conjunction

with the bevelled faces of the rings and plates, cause the rings to expand and preserve a steam-tight sliding connection between the piston and the cylinder.

3. Applying "packing to rotary pumps or meters formed by "the rotation together of two toothed or corrugated surfaces in a "chamber, such packing being forced down inclined planes "against the revolving wheels by springs or other elastic "medium."

4. Vertical cylindrical boiler containing lower combustion chamber, which opens upwards into a multitubular arrangement of fire-tubes extending from the top of the chamber to the crown of the boiler; the tubes are curved or waved, in order the better to compensate or yield to the effects of expansion and contraction, and by passing up through the steam space they superheat the steam. Two furnaces are fixed respectively at opposite sides of the boiler, the fire-grate bars inclining forwards out of a vertical position; the backs of the furnaces are bounded by a series of closely packed water tubes, which extend upwards from the lower water space to the top of the combustion chamber, into which between the water tubes, the flaming gases pass from the furnace.

5. Regulating "the pressure of steam from a steam boiler by "applying to the steam passage a pair of valves (one above, the "other below) connected together and to a corrugated or undu-"latory dome of thin metal adapted to yield somewhat to the "pressure of steam, and thereby admit of the action thereon of a "weighted lever on the outside thereof, the weight on which "lever may be varied to suit the pressure required."

[Printed, 8*d*. Drawing.]

A.D. 1861, October 21.—N° 2625.

CALVERT, Francis Alton.—This invention, relating to engines which may be worked with either steam or compressed air, consists in supplying (say) steam to one or two cylinders, each containing two pistons; the lower pistons containing one or more vacuum valves to supply the upper pistons with steam when the expansive force of the steam is expended. The valves and the cushion chambers for the upper pistons are of the principle described in the *Specification of this* inventor, dated 14th September 1860, *No. 2218, with the additional* means of conveying the steam from

the cushion chambers to the steam chest, and fitting an annular admission valve outside the cylinder. The exhaust ports consist of annular rows of holes; each air cushion communicates with the admission valve chest; the lower pistons, which receive motion from a cam, and traverse about one-fourth the length of the cylinder, are actuated by toggle joints; when only one cylinder is used, the piston is counterbalanced; the upper pistons are connected to a crank shaft or beam. At the commencement of a stroke, both pistons travel together, but when the lowest has completed its stroke, steam is instantly admitted between them, which impels the upper one forward to the end of the cylinder. Each cylinder is single acting, receiving steam to effect the upward stroke, the crank being near the position to obtain full leverage. During the admission of steam it enters the cylinder with full force, regulated by a movable inclined tappet which is lifted so as not to operate the admission valve when the load is suddenly thrown off.

[Printed, 10*d.* Drawing.]

A.D. 1861, October 23.—N° 2647.

WILSON, John William.—(*Provisional protection only.*)—This invention relates to digging and cultivating machinery, and to steam engines for agricultural purposes. The cultivating machinery consists "of a revolving shaft, furnished with an "eccentric, connected by links to crank shafts, to which are "attached spades and picks, in such a manner that the spades and "picks enter and are drawn out of the soil at any angle to its "surface, whereby the operations of loosening and turning the "soil are effected with less power and more effectually than hereto-"fore." When not in use, by means of the eccentric, the implements can be raised above the surface. Regarding agricultural steam engines, the invention consists "in mounting the bearing "wheels on bushes, through which the crank shaft works. The "leading or guiding wheels are acted upon by a steering apparatus, "consisting of a worm and worm wheel, and a pinion and sector, "or other equivalent arrangement of parts. The speed of the "engine is reduced to suit the speed of the bearing wheels by a "counter shaft, which is driven from the crank shaft by pulleys "and chains or by gearing, and the counter shaft is provided "with a set of differential wheels for equalising the action of the

"chains or gearing in going round curves." When the engine is employed to operate the mechanical cultivators, the strap with the spades and picks is turned round from the crank shaft by a chain and chain pulleys, or otherwise.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 23.—N° 2654.

JOHNSON, John Henry.—(*A communication from Joseph Harrison.*)—This invention relates to removing and preventing deposit in steam boilers by applying within the water space of the boiler any convenient number of rotating helical vanes or spirals placed to revolve by suitable contrivances inside the water tubes, or outside when the tubes act as flues, so as by their motion to prevent calcareous or other deposits upon the internal surfaces, and to keep such matters in suspension until blown off. Applying in the water spaces surrounding the fire-box of locomotives, a number of rotating arms or "spiders" fitted loosely on any desired number of stays provided at their ends with cups or chambers, so that the bubbles of steam will collect within underneath and cause them to rotate, when the spiders will disturb deposits forming therein. The ascending steam current, which rises out of the water in a state of ebullition, is made to act on spirals within vertical tubes for the same purpose. Various arrangements are shown and described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, October 23.—N° 2655.

MARSHALL, John.—(*Provisional protection only.*)—This invention relates to traction engines, wheels, and carriages. Regarding engines, it consists in placing the shaft of the driving pinion, which gears into the annular toothed rack of the driving wheels, forward of and on the plane of the main axle, which, as also the pinion shaft bearings, slide in vertical guides to allow play for the springs. Suitable intermediate gearing is provided to obtain the requisite changes of speed. Carriages drawn by traction engines are furnished with annular toothed gearing, actuated by pinions on transverse shafts, which obtain motion through a horizontal shaft, extending longitudinally beneath the carriages and connected to the engine by suitable gearing and couplings. In the construction of wheels for traction engines and common road

carriages, a raised rail is placed within the rim or felloe of the wheel, and by means of a frame with two arms and two grooved rollers a portion of the weight is, by the forward pull, thrown in advance of the line of direct contact or pressure of the wheel upon the ground.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 25.—N° 2671.

GREEN, EDWARD, and GREEN, EDWARD, the younger.—This invention relates to apparatus for generating, superheating, and condensing steam. These generators consist of various arrangements of vertical groups of water tubes, which taper downwards and communicate top and bottom with horizontal tubes and chambers; the walls of the furnace are formed by fitting tubes so closely together by planing their surfaces, or by metal packings or otherwise, that the air is excluded and no heat allowed to escape; these wall tubes may be curved; in some cases the apparatus is enclosed by brickwork. The feed water is supplied to the bottom tubes or chambers which are fitted with blow-off cocks for clearing off sediment. The top of each vertical tube is fitted with a cap removable for the purpose of ascertaining the internal condition of the tube; the external form of these water tubes is hexagonal, octagonal, or many-sided; they gradually increase in diameter from the bottom to the top, and are kept clean externally by scrapers, which, by means of suitable apparatus above, are kept in contact therewith continually moving up and down. The working water level is established within the vertical tubes near the top, and for the purpose of superheating the steam they generate, the apparatus is placed on an incline rising towards the back, so that the water level may be lower in those tubes furthest from the fire, where, before the products of combustion have reached, their caloric elements have been considerably reduced and absorbed. The vessels or tubes into which the vertical tubes discharge their steam are composed of copper, or such metal as will yield to any unequal expansion; these tubes or vessels are connected by branch pipes with longitudinal cylindrical steam chambers, whence the engine is supplied. The furnace, which is placed in front, is of the usual construction; the passage of the flaming gases is between and amongst the vertical water tubes into the chimney flue. In some cases by making a wall of the central row of tubes,

the hot draughts are made to return through one side of the furnace to a chimney flue in front. The condensing apparatus consists of a chamber filled with vertical tubes; the condensing water passes down the tubes, and the steam, by means of diaphragms, is directed laterally and alternately from side to side during its passage through the apparatus. The heated water issuing from the apparatus is used to feed the boiler, and a fan or other suitable appliance is used for drawing off the steam generated therein, when, as in one condensing arrangement, the steam passes down the tubes and the water in comminuted films or sprays passes amongst them. The scrapers are applied to the condenser tubes.

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1861, October 29.—N° 2708.

FURLONGE, WILLIAM HOLLAND.—This invention relates to surface condensing, principally designed for marine purposes, and applied to both condensing and high-pressure steam engines, the water produced by condensation being returned to the boiler. The outer casing of the condenser is a cast-iron cylinder; tube plates are placed near each end, so as to leave small chambers beyond; the space between the tube plates is filled with tubes, through which, drawn by a centrifugal pump, there is kept up a constant current of cold water, which, passing into one end chamber, is there distributed through the tubes, and flows on to the other end chamber, and thence to the pump. The exhaust steam is conducted through a pipe into the body of the condenser, where it plays upon the surface of the water tubes; a pipe conveys away the water of condensation to be returned to the boiler, and another pipe is attached to the condenser for the escape of air to the atmosphere; in the case of low-pressure engines, this pipe is attached to a small air pump. The tubes are made tight in the tube plates by the use of india-rubber ferrules, which act as packings between the pipe ends and the holes in the tube plates, and the tube plates are secured by the pressure all round of large india-rubber hoops, which allow for contraction and expansion. In screw steamers, the propeller can, if desired, be made to draw the water through the condenser and deliver it near the stern post.

[Printed, 10*d.* Drawing.]

A.D. 1861, October 31.—N° 2732.

FANSHAWE, John Americus, and JAQUES, James Archibald.—This invention relates to the construction of steam generators. A series of narrow convoluted spiral flues are placed a short distance apart side by side through the whole length of the generator forming water spaces between each; the flaming gases from the furnace below enter the outward circles of the spiral flues, and gradually convolve to the centres, which are in open communication with a central flue tube; hence they pass through a longitudinal superheating tube placed within the steam space in the upper part of the generator, and thence to the chimney. Wrought-iron tie pipes, which support the furnace bars, and pass through the central flue, open to the water spaces and keep up a circulation of the water; these pipes act as longitudinal stays, and in conjunction with other stay rods, keep the parts together; the usual appliances of safety valve, steam and water gauges are provided. The whole apparatus is contained within a wrought metal casing or shell.

[Printed, 1*s*. Drawings.]

A.D. 1861, November 1.—N° 2741.

WHITEHEAD, Thomas Boden.—(*Provisional protection only.*) This invention relates to steam boilers and other steam chambers, and consists in a mode of inspecting the interior of a boiler or chamber containing steam, for the purpose of ascertaining its state, the level of the water therein, and of making other necessary observations. Natural or artificial light is reflected into the boiler through an opening covered with a strong plate of glass, the inspection being made through another opening covered with the same material; the reflecting apparatus is covered by a casing to convey away steam in the event of a fracture of the glass, and a stop cock is provided for the admission of air to the illuminating material, in order to ensure combustion.

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 1.—N° 2749.

HENRY, Michael.—(*A communication from Henry Gifford.*)—This invention relates to steam engines and boilers, for the generating and using steam at very high pressure, say, at least five

times the pressure ordinarily employed. Several arrangements of boilers are described which are exemplified by the following description :—These boilers must be very strongly made in order to bear the intended pressure; the furnaces may be either contained within the boiler, or within fire brick chambers underneath or outside; the shell may be constructed with strong plates to form water casing, or with a series of annular rings half lapped and screwed together; the inner space is filled with water tubes, which when they are made to pass through the boiler shell, are closed and capped; the tubes are arranged in various positions, they are screwed into the tube plates, and communicate with a strong chamber, which is a reservoir for water and steam. The usual safety appliances are fitted to these boilers. The engine cylinder is a long tube of small diameter, wherein to work at each end are fitted two single action plunger pistons; the valve box is fixed at the side of the cylinder, equidistant from the ends; the centre of the cylinder between the action of the two pistons is plugged solid, so that the pistons act independent of each other, excepting as they are timed to reciprocate motion, by two single action slide valves which are relieved from steam pressure. Instead of the two plungers acting in a line in opposite directions, they may be placed beside each other; connecting rods are jointed to the plungers, which work into the atmosphere through the usual stuffing boxes.

[Printed, 10*d*. Drawings.]

A.D. 1861, November 5.—N° 2772.

WILSON, Robert.—This invention, relating to steam hammers and valves applicable thereto and to other engines, consists in an arrangement of valves and working gearing, which will cause the steam to be admitted either only below, or above and below the piston to which the hammer block is connected. In constructing slide valves for steam engines, the valve piece works between faces, as described by this inventor in his Specification dated 5th September, 1856, N° 2070. In the balance plate there are ports of the same area as those on the opposite face, the steam being admitted through and exhausted from both sides of the valve simultaneously. The case in which cylindrical valves for steam hammers work, is provided with ports of an equal size on both sides, and *segmental projections* on one end of the valve, cover *the ports when it is partly* turned, and partially or entirely cut off

the steam from one end of the cylinder. When the improved flat slide valve is used with self-acting motion to steam hammers, two valves are used in separate steam boxes, one to supply steam above, and the other below the piston; the gearing being so arranged as to shut off the steam from the top valve when not required, and to admit it to the top of the piston by increasing the length of the stroke, whereby the action of the hammer is accelerated and the force of the blow increased. Modifications of the valves and gearing applicable to marine and other engines and machines, which differ only in detail, are shown and described.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, November 5.—N° 2776.

HAYES, Charles Frederick.—This is an invention of apparatus for the rapid generation of steam during the passage of the feed water through a continuous length of pipe. The shell of the apparatus is a thin double casing, the ends showing in the form of a horse-shoe, standing on its two prongs which form the seating. A cylindrical steam chamber is fixed to the casing by means of hollow packing stays concentric with the arc of the interior, so as to leave a flue space for the flaming gases which play over the whole surface of the interior of the casing, and upwards over the whole outside surface of the central steam chamber, passing off to the chimney through a passage in the crown of the casing. A series of short pipes ranged in a line side by side are placed over the furnace against the under side of the steam chamber; the ends of these pipes are united by short bends, so as to form a continuous winding passage for the feed water, which is forced through by a pump and passes thence into a similar formed winding passage in pipes placed along the bottom within the steam chamber, where the passage terminates in a perforated distributer. During its serpentine passage through the winding pipes, the feed water is converted into steam, which is afterwards dried and superheated within the steam chamber, and also within the casing which is covered with a non-heat conducting material and serves as a reservoir for the steam. There is no space for water in the apparatus. The ends are enclosed by metal plates.

[Printed, 10*d.* Drawing.]

A.D. 1861, November 5.—N° 2778. (* *)

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Alexandre Friedmann and Frederic Emile de Erlanger.*)—"This "invention consists in fitting in fire-boxes or furnaces of loco- "motive, marine, and other steam boilers, an arched or dome- "shaped water vessel communicating with the boiler for its "supply of water through pipes entering the bottom or lower "part of the vessel, and with the steam space in the boiler "through serpentine pipes carried from the top or upper part of "the vessel. The invention also consists in forming an air "passage outside the fire-box or furnace, and in regulating the "admission of air by means of a valve or valves, and causing it "to enter both under and through the fire-bars and fuel and over "the fire. By preference the fire-bars are formed in two sections, "one, that upon which the fuel is received, is fixed, and the other "is free to be moved by a weighted lever upon an axis upon "which it is pivotted."

[Printed, 10*d.* Drawing.]

A.D. 1861, November 7.—N° 2794.

WILLIAMSON, ALEXANDER WILLIAM.—This invention relates to the construction of "steam boilers entirely of tubes or tubular "vessels, arranged in such a manner that each tube has perfect "freedom to expand and contract by being attached only at one "end to and communicating with a tube or tubular vessel, serv- "ing to connect a number of such tubes together, the other ends "of such tubes being closed, and simply steadied or held in posi- "tion by suitable contrivances. These tubes are placed either "in a slanting or vertical position, with the closed ends either "upwards or downwards, whilst the connecting tubes or tubular "vessels to which they are attached are placed in a horizontal or "nearly horizontal position. Those tubes that are fixed with "their closed ends upwards are filled only partially with water, "the upper ends serving as steam chambers, whence the steam "is conducted through pipes fixed inside the tubes into other "pipes or equivalent passages, fixed or formed inside the con- "necting tubes, whence the steam is conducted in the usual way "to wherever it may be required. By this arrangement, not "only is each tube or element of the boiler capable of expanding "and contracting, without in any way straining the connections,

"but also any defective tube or tubes can be readily removed and "replaced by another or by others, without in any way inter-"fering with the other connections."

[Printed, 10*d*. Drawing.]

A.D. 1861, November 15.—N° 2878.

NEWTON, William Edward.—(*A communication from Wellington Lee.*)—This invention relates to "steam engine governors." In order to make such governors more sensitive, the balls are made hollow and accurately turned in a lathe; they are then filled with lead or metal of high specific gravity; the centripetal force of the governor balls towards the centre of gyration, does not depend upon the gravitation of the balls, but is effected by the weight of a hollow vessel centrally secured to the spindle slide and filled with heavy metal. While the tendency of the centrifugal force of the balls in action is to raise the slide, the weight of the central vessel will be constantly tending to force it down, thus the pressure on the slide is always constant. The pressure exerted by the weighted vessel may be adjusted with great accuracy by adding to or diminishing the quantity of lead until the proper equilibrium is obtained. In marine engines it may be found of advantage to employ a coiled spring instead of the central weighted vessel, the governor may then be placed in a horizontal position; and when it is necessary to accelerate or diminish the speed of the ship, in accordance with the state of the weather, the speed of the governor may be regulated by the use of a pair of cone pulleys.

[Printed, 1*s*. Drawings.]

A.D. 1861, November 19.—N° 2905.

TAYLOR, John, and HEPWORTH, Thomas Howard.—(*Provisional protection only.*)—This invention of equilibrium lubricators is applicable to steam cylinders, valve boxes, and other similar purposes.

It "consists in fitting in the interior of the cup or vessel con-"taining the tallow or lubricating matter a spindle having two "valves, fast or otherwise, one at the top and the other at the "bottom of the vessel, and fitting seatings in such manner that "when the spindle is pressed downwards the upper valve is "opened, and allows the lubricating matter to enter the cup or

" vessel, and at the same time close the lower valve and prevent " any admission of steam, and when the spindle is raised by a " spring or other means the upper valve is closed and the lower " valve opened, which admits steam to the top of the lubricating " matter, so as to form an equilibrium and allow the said matter " to fall of its own gravity into the steam cylinder, valve box, or " other vessel to which it is applied."

[Printed, *4d.* No Drawings.]

A.D. 1861, November 21.—N° 2928.

NEWTON, WILLIAM EDWARD.—(*A communication from John Benjamin Root.*)—This invention relates especially to that class of rotary engines in which the main shaft and the rotating piston drum are arranged eccentrically to the outer cylinder, and consists (1), in controlling and directing the combined radial and oscillating movement of the pistons, by packing and fitting to their faces segment-shaped pieces of metal, and providing bearings for them in the drum; also attaching arc-formed pieces to the inner ends of the pistons, which work in grooves formed in the cylinder heads.

2. Employing packing rings of a peculiar [construction within the cylinder heads, in combination with the piston drum, piston packing, and cylinder abutment, to prevent the escape of steam.

3. Pressing out the packings into close contact between their wearing and their opposed surfaces, by admitting steam to act expansively against the backs of such packings.

4. Consists "in the arrangement of a valve, partition, and " passages in combination with a steam jacket, round the cylinder " of a rotary engine for the purpose of providing for the warming " up and expansion of the cylinder by steam from the boiler before " starting the engine, and for keeping the cylinder during the " operation of the engine warmed and expanded, partly by steam " from the boiler, and partly by the exhaust steam from the " cylinder; and it further consists in the arrangement of exhaust " valves, in combination with the steam jacket and its appur- " tenances, above mentioned, to provide for the free exhaust of " the steam in whichever direction the engine may be rotating."

5. Consists in so applying and securing the cylinder heads to the cylinder, that unequal expansion is provided for, and the binding of the piston drum and pistons prevented.

[Printed, 10d. Drawing.]

A.D. 1861, November 22.—Nº 2931.

YARROW, Alfred Fernandez, and HILDITCH, James Bracebridge.— This invention relates to locomotive steam carriages for common roads; consists (1), in arranging the cylinders to work cranks which are fixed on the extreme ends of the main axle outside the driving wheels; the cylinders are bolted to the framing which extends the whole length of the carriage; the bearings of the main axle are supported by springs; one or more links attached to each bearing connects them to the framing, and maintains the proper distance between the cylinders and the cranks during the play of the springs. 2. Relates to the general arrangements. A vertical tubular boiler is placed between the driving wheels at the back of the main axle; accommodation for passengers and luggage is arranged upon the framing between the boiler and the fore part of the carriage, where the steering apparatus is also placed; room for the stoker, coal bunkers, and water tanks is provided abaft the boiler; the valves are worked by excentrics fixed upon the main axle. By means of communicating rods, the reversing gear and steam cocks may be placed under the control of the steersman.

[Printed, 6*d*. Drawing.]

A.D. 1861, November 22.—Nº 2933.

DE CLERCQ, Renil, and CHAZELLES, Emile.—This invention relates to automatic apparatus for raising and supplying boilers with water or for other purposes. Two separate vessels placed on different levels are employed, one as a supplementary vessel for supplying water to condense the steam in the other, both acting simultaneously for drawing up the water,and so that the supplementary vessel always remains full when the steam pressure forces the contents of the other vessel into the boiler. Fitted on the top of the condensing vessel is a valve box, containing the slides or valves for the admission of steam and water; the movements of these slides or valves are regulated by a float in another vessel fixed to the condensing vessel, and communicating therewith by a syphon pipe, which causes the float in the lower vessel to work the slides and valves only when the apparatus is filled with water. A pipe from the supplementary vessel leads to the water supply, and other pipes to the condensing vessel and valve box, which has also a pipe for discharging air. The apparatus being filled with water and free from air, its operation commences. The

float in the lower vessel having closed the slide which admits water opens the slide which admits steam, and the cock is turned to allow the discharge of water into the boiler; the steam acts upon the float in the condensing vessel and forces the water through the syphon pipe, and through the pipe leading to the bottom of the boiler; when the water is discharged from the condensing vessel, the float in the other vessel has descended by its own weight, closed the steam slide and opened the slide for allowing water to pass from the supplementary to the condensing vessel, which causes a vacuum throughout the apparatus. "The " atmospheric pressure acts on the water of supply and fills the " entire apparatus with water, and it is at this moment that the " syphon becomes useful, for the water in the condensing vessel " can only pass into the float vessel through a tube, when the " water has risen to a certain height, unless forced through the " syphon by pressure, and therefore the float is only raised to act " on the slides or valves when the apparatus is full of water. " When the said float has been raised, the slide for the admission " of steam is again opened, and the water is forced out of the " condensing vessel into the boiler, and at the same time the " other slide is opened for the admission of water to form a " vacuum, and then the water rushes from the supplementary " vessel into the condensing vessel, and thus the operations con- " tinue self-acting." The feed water is heated by placing a coil of pipe within one of the vessels in communication with the exhaust steam.

The arrangements may be modified by dispensing with the float cylinder and float and be then used for raising water from a considerable depth and impelling it with great force. The number of vessels composing the apparatus will vary according to the purpose to which it is applied. When used for supplying locomotives, the tank of the tender represents the lower chamber, the upper chamber being mounted upon it. A vacuum is formed in the tank by filling it with steam, which is condensed by the water from the upper chamber; the fresh supply of water will then be sucked up from a reservoir below the rails.

[Printed, 1s. Drawing.]

A.D. 1861, November 22.—N° 2940.

HENRY, MICHAEL. — (*A communication from* Francisque *Million.*)—*This invention* relates to a mode of packing stuffing

boxes for preventing the escape or admission of steam or other fluids around piston or other rods and such moving parts of engines and machinery as pass to and fro through partitions from one fluid medium to another, or from the same to the same under different conditions of pressure or temperature. It is a substitute for the ordinary hempen gaskin packing, and consists (as applied to a piston rod) of a stuffing box internally made somewhat larger than usual in relation to the size of the rod. A flanged bush, bored to slide easily but steam-tight upon the piston rod, is placed flange downwards upon an elastic washer which rests on the bottom of the stuffing box; another flexible washer is placed upon the bush, and rests upon the flange; the annular space outside the bush is filled by a gland of the ordinary description, secured to the stuffing box in the usual way by screws; the extreme diameter of the flange on the bush is a trifle less than the internal diameter of the bottom of the stuffing box, in order that the bush, which fits steam tight to the rod, may accommodate itself laterally to any inequalities in the direct line of the shaft. Several modifications are described and illustrated, in some of which the bush and gland are substituted by a series of thick metal washers which fit the shaft and have elastic washers between. Also a mode of cooling the bush is shown, which consists in passing, by means of a supply and a delivery pipe, a continuous or intermittent stream of cold water through a recess in the bush.

[Printed, 8*d*. Drawing.]

A.D. 1861, November 23.—N° 2942.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Eugène Constant Marie Bonnier*.)—(*Provisional protection only*.)—This invention relates to "apparatus for the multiplica-" tion of motive power" by means of "an auxiliary lever appa-" ratus," which consists of a series of pairs of levers jointed together, and so arranged that the centre or fulcrum of each pair of levers shall traverse to and fro in a line upon a slide; the lower ends of two connecting rods, which are jointed to the opposite ends of a beam actuated by the prime motor, work on the joint pins which unite the first pair of levers; the motion of the beam in one direction brings the levers into a somewhat packed position approaching towards a parallel with each other, and its opposite motion into a position so extended that obtuse

angles are assumed by each lever with regard to its companion, and between each pair in relation to the others in the series, whilst the length of motion of each pair increases in proportion to the ratio of the number of its position in the series, which is ascertained by multiplying its number by the length of the motion of the first pair. A connecting rod jointed to the fulcrum of the last pair of levers actuates a crank on a driving shaft at an increased rate of motion, the throw of the crank being about double the sweep of the lever, which is an increase of speed, and, as the inventor calculates, "a multiplication of power."

[Printed, 6*d*. Drawing.]

A.D. 1861, November 23.—N° 2948.

BRAY, William.—This invention relates to traction engines and apparatus adapted to agricultural purposes. The machinery, which comprises the engine, consists of one or two boilers and one or two steam engine cylinders, supported on the framing over the main axle, which thereby sustains the principal part of the weight. The main axle consists of two parts or semi-axles, which project respectively from the ends of a central double socket piece, made tubular at both ends to receive the semi-axles which project and carry the wheels and the spur gearing, whereby the wheels can, either together or separately, be set in motion. The ends of the semi-axles, whereon the wheels revolve, are cranked so that the centres of revolution are eccentric to the centre of the axle; by means of this contrivance one driving wheel may be adjusted to revolve in advance of the other, or by bringing the eccentricity of either wheel below the centre, the wheels may be adjusted to run on different levels without effecting the horizontal level of the machine. The steering is managed by operating on the driving wheels. Two boilers are preferred, one on each side (fore and aft) the axle; the engines may be similarly arranged. Connected to one or both ends of the engine (for agricultural purposes) is a frame, firmly bolted or hinged to an under locking piece of the engine. This frame is supported by a wheel, which will either run upon the unploughed ground or in the last furrow. The shape of the frame varies from an oblong for some operations, to a form approaching a triangle for others; several movable beams are longitudinally attached to the frame, whereto the implements are fixed at suitable distances by means of blocks or screws.

Mechanical arrangements are provided for raising or lowering the implements, either together or separately, by means of a rack and pinion, in order that they may operate alternately in sets according to the direction of locomotion. When not required for tilling operations, a wagon body capable of carrying farm produce, coals, or manure, may be placed upon the frame, and the engine be employed for removing them, as well as for threshing, grinding, pumping, and such like operations.

[Printed, 8*d*. Drawing.]

A.D. 1861, November 25.—N° 2951.

PENDRED, VAUGHAN.—(*Provisional protection only.*)—This invention relates to surface condensers.

1. To a mode of protecting elastic packing round the ends of tubes when fixed in tube plates, by means of metallic collars, brazed or otherwise, attached to the ends of the tubes, and made to fit accurately within the holes of the cast bosses in the tube plates, in order that no part of such packings be exposed to the action of either steam or condensing water. 2. The use and disposition of diaphragms or partition plates attached to alternate sides of the condenser or tube plate, forming thereby partial partitions whereby the current of steam or water is compelled to take certain courses, in order that the whole cooling surface of the condenser may act uniformly and effectively. 3. The use of galvanized iron for the construction of condensers, or of iron covered with glazing. 4. The so arranging the tube plates of surface condensers by attaching or casting to the inside of the condenser suitable flanges or angle pieces, that a group of tubes may be removed for repairs or otherwise, whilst the condenser, by temporarily bolting over the openings thin plates of metal, may be kept daily at work; in this manner the whole of the tubes may be removed and repaired.

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 25.—N° 2953.

MACINTOSH, JOHN.—This invention relates to obtaining motive power and to apparatus for applying it. It consists, 1, in effecting the propulsion of vessels and carriages by means of the impulsive force of jets of steam conveyed from the steam boiler through pipes, and issuing therefrom through orifices

(either alone or in conjunction with liquids) against surfaces inclining obliquely from the direction of the steam or liquid. By altering the inclining angle of the surfaces in relation to the line of issue, the direction of the vessel or carriage may be correspondingly changed. 2. "Consists in attaching a series of "plates, in an inclined position, on a hollow shaft mounted on "bearings and furnished with stuffing boxes. The steam is con-"veyed from the boiler to the shaft by pipes issuing through "orifices under the inclined plates, causing the shaft to revolve, "the whole being enclosed in an outer casing, through which the "waste steam passes." 3. "Consists in fixing a series of "inclined plates or boards on a long shaft furnished with bear-"ings and secured with a frame, which may be whole or partly "immersed in running water, which impinges against the inclined "plates or boards, causing the shaft to revolve, from which "power is obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 25.—N° 2961.

NEWTON, Alfred Vincent.—(*A communication from Lewis Baird.*)—This invention relating to a "method of removing and "preventing the formation of calcareous and saline deposits in "steam boilers," consists in introducing into the boiler a certain quantity of tobacco, either in the leaf, or pressed, or otherwise prepared, it being secured in a bag in order that the fibrous parts may not mix with the water or steam. A decoction of tobacco may be introduced with the feed water, or it may be used in the form of a concentrated extract, for the manufacture of which American Letters Patent were granted to George Jacques in the year 1859; one lb. of the extract, which contains the strength of 4 lbs. of tobacco leaf, is sufficient for one ton of sea water; this quantity is sufficient to cover the internal surface with a coating of glaze or varnish, to which no deposit or calcareous matter will adhere; when the glaze is established, occasional application in much smaller quantities will maintain it.

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 27.—N° 2979.

STANDFIELD, John.—This invention relates to regulating and *indicating the speed of* engines and machinery.

The apparatus for regulating speed consists of a vessel containing a fluid in the lower division, in which, horizontally fixed to a central spindle, a series of fans revolve; a number of blades are fixed to the sides of the vessel, so as to project into the spaces between the revolving fans; within the upper division or chamber there is a frame which revolves with the upper spindle, it is placed vertically in a line with the lower spindle, to the upper end of which the frame is attached; placed outside the top of the vessel, loose upon the end of the upper spindle, there is a band pulley connected within the top of the vessel to a bevel friction pulley, also loose upon the spindle; the frame carries the companion friction bevel fixed on a loose stud which has liberty to revolve; on the other end of the stud there is a small pulley, to which the end of a band is fastened, the other end of the band is fastened to a driver on the spindle. When the apparatus is acting at the working speed, a certain uniform amount of resistance is offered to the fans on the lower spindle by the fluid, which is checked in its circumfluent action by the projecting blades; this resistance increases when the speed is accelerated, causing the companion bevel to revolve and rotate the stud and small pulley, and by means of the band attached to the driver, to lift the spindle which acts on a bell-crank weighted lever and connecting rod, and so operates a duplex equilibrium valve through the valve lever as to bring the movement of the engine to its ordinary rate of speed. Furnished with a graduated scale and communicating with the fluid in the vessel is a transparent vertical tube, up which, driven by the centrifugal force of the revolving fans, a column of the fluid rises, whereon a float indicates on the scale attached to the tube the height of the fluid; the scale being graduated to represent by figures the number of revolutions of the engine at any given height of the float.

Modifications of the principle of the invention are shown and described.

[Printed, 10*d*. Drawing.]

A.D. 1861, November 27.—N° 2982.

RYDILL, GEORGE.—(*Provisional protection only.*)—This invention relates to Cornish and other boilers, for the purposes of consuming and condensing smoke and for ventilation. Instead of dividing the furnace end of the flue tubes into furnace and

ash-pit, it consists in disposing the fire-bars over an opening cut through the bottom of a horizontal tube, which communicates with an under brickwork passage or culvert, thorugh which the atmosphere is supplied to the furnace; a range of boilers may be disposed side by side over the air draught passage; ash-pits are formed under the boilers where there is no draught passage. Bridges constructed of boiler plates which form water space are used instead of those formed by fire-brick; also arching the inside of the boiler flue tubes with fire-brick gives out a more uniform heat; the furnace is also lined with fire-brick. The smoke and products of combustion having passed into the chimney flue, are played on by springers in connection with the boiler, which shed a shower of fine watery particles over the passing hot draught, thereby condensing their smoky, sulphurous, and carbonic elements, leaving only white vapour to rise from the chimney, for which the latter is alone required, as the force of the watery shower from the springers directed towards the chimney produces sufficient draught for all the purposes of combustion. The principle may be applied to locomotive and marine boilers. In the former, air is admitted through side openings to the furnace, and the water springer pipe is a substitute for the ordinary steam blast; and in the latter, after the condensing process the residue of the products of combustion pass into the atmosphere somewhere about the stern.

Smoke and gaseous products from other furnaces may be so treated, dust arising from machines be collected and carried away, and the water from the condensing spray be utilized for chemical purposes.

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 29.—N° 3011. (* *)

TONKS, SAMUEL, and BROOKES, JOB.—(*Provisional protection only.*)—"Our invention consists in building steam-boiler " furnaces with the fire-bars or fire-place in front of or on the side " of the boiler, so that the fire of the furnace does not strike " directly on the bottom of the boiler. Beyond the bars or fire- " place is a wall or bridge rising a short distance above the level " of the said bars or fire-place, and still further protecting the " boiler from the action of the fire. The furnace is covered in " over the fire-place with an arched top. In setting, according to " our invention, such steam boilers as have large internal flues we

" build in the front ends of the said flues a lining of fire-brick, " so as to defend the said flues from the injurious action of the " fire."

[Printed, 4*d*. No Drawings.]

A.D. 1861, December 4.—N° 3045.

PULLAN, Abraham, and LAKE, William.—(*Provisional protection only*.)—This invention relates to traction and other engines, to engine and carriage wheels, and to the giving motion to ploughs and other agricultural implements. It consists of a variety of improvements, alterations and additions, which comprise; the use of a stud and socket to prevent the vibrations of the driving wheels being communicated to other parts of the engine; keeping the pinion on the driving shaft in gear with the driving wheels by means of adjustable springs. When springs are used to traction engines with chains or ropes, the shafts are kept parallel with each other by means of frames or links tied together by transverse braces. When required, the chains or ropes are tightened by the use of screws and sockets. Fitting an auxiliary bearing wheel to engines constructed according to a former patent granted to this inventor and David Longstaff, dated July 14th, 1859, No. 1670. This auxiliary wheel is for the purpose of increasing the bearing surface; it is mounted on a collar which embraces the main axle; the surface of its periphery may be either plain or furnished with transverse projections for holding to the land. When required, it is brought into or thrown out of action by means of a screw. In order to prevent the slipping of driving wheels, they are furnished with pins or teeth which are projected divergently through their peripheries by means of springs which yield when acting against stone or hard surface. Grippers and teeth are also employed for the same purpose. Supplemental removable rails or shoes united by links are used in connection with the bearing wheels. The invention extends to various other details, including gear with chain and ropes for hoisting and other purposes, and also includes a mode of causing the piston rod of the engine to act also as the connecting rod. By means of a joint the rod is attached to the piston, and the vibrations of the rod provided for by fitting a curved slide (which carries the stuffing box) to the cylinder cover. Giving motion to the wheels of ploughs and implements by means of cords or

chains operated by drums or pullies attached to the engine, and so arranging the fore carriage of the engine that the axle of the steering wheels has liberty to vibrate and accommodate itself to unlevel places on the surface of the road or way.

[Printed, 4*d*. No Drawings.]

A.D. 1861, December 5.—Nº 3048.

KNOWELDEN, John.—This invention, relating to pumps, is supplemental to a prior invention for which Letters Patent were granted to this inventor and Downs Edwards, bearing date July 7th, 1859, Nº 1613. The present invention consists in forming a circular valve chamber and fitting the valves to feathers fixed on a circular plug; by means of a handle outside connected to the plug, the action of the pumps may be reversed, so that the suction pipe may be made to act as the force or delivery pipe, and the previous delivery pipe be changed to the suction. The valves require no fastening, and may be withdrawn, and after examination replaced at any time. Pumps for donkey engines are made double acting by fixing a piston on the end of the plunger, through the centre of which an upward passage is formed, which passage is closed by a valve during the upward stroke. The piston fits the barrel, but the plunger is of less diameter, so that an annular space which communicates with the outflow is formed above the piston. A foot valve governs the inlet at the bottom of the barrel. When the piston rises, the water is drawn into and fills the barrel beneath it; on the downward stroke of the piston the foot valve is closed, and the water passes up through the piston valve into the annular space above, which being too small to contain the whole quantity, about one-half the water is forcibly discharged through the outlet, and the other half is discharged by the succeeding up stroke of the piston while fresh water is being drawn in below. A modification of these pumps is applied to the working of hydraulic presses and other purposes.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, December 6.—Nº 3057.

WOODWARD, Adam, WOODWARD, Robert, and WOODWARD, William.—This invention, relating to compound steam engines, consists (1) in fixing an oscillating or fixed high-pressure cylinder between the pillars of a beam engine or between the

pillars and the wall of the engine house. The high-pressure cylinder works on to a separate crank shaft, connected by spur wheels to the main shaft, or it may give off separate power; it either exhausts into the cylinder of the beam engine, or into the condenser.

2. Arranging an oscillating or fixed high-pressure cylinder to work as an auxiliary, at the end of a horizontal engine, where it is mounted upon a metal framing; it works on to a separate crank shaft, connected to the main engine shaft by spur gearing; if required, it may give off separate power.

3. The so arranging and constructing the metal framing, which carries the fixed or oscillating high-pressure cylinder, that the resistance to the force of its piston is contained within the framework.

[Printed, 10*d*. Drawing.]

A.D. 1861, December 6.—N° 3058.

BAILEY, John, and BAILEY, William Henry.—This invention, relating to vacuum, pressure, and speed gauges, consists, 1, in the attachment of a knife-edged pivot to the weight employed in such gauges, so as to act as a lever. The ordinary india-rubber or metallic diaphragm is employed to press against the piston in the usual manner. The knife-edged pivot rests upon a semicircular bearing at the bottom of the link which connects the piston and weight, so that a delicate motion almost devoid of friction is obtained; the ordinary alarm and safety valve may be combined with this gauge. 2. Consists in the application to spring gauges of a regulating lever arm connected by a link to the piston, the top of which is in contact with the spring. 3. Relates to the employment of a lever in heat gauges, and steam and water traps. The end of this lever is in contact with the flange of a metal tube, through which the steam and water pass; the expansion and contraction of the tube operates upon the lever and indicates by means of a wheel and pinion in connection with the index hand the degree of temperature. In steam or water traps the lever operates a valve which lets off an amount of steam or water in proportion to the degree of temperature. 4. Relates to ascertaining the speed of any body in lineal or rotary motion, by means of an ordinary ball governor, actuated by such moving body. A rod is attached to the sliding

sleeve, which on rising presses the rod against a lever attached to a wheel, which gears into the finger pinion, thereby indicating the exact speed on the dial. This arrangement is modified, whereby the indicator is actuated by either a vibratory or revolving motion. 5. Relates to the use of papier maché in the manufacture of dials and cases, and to the use of aluminium or its alloys for diaphragms and other details liable to oxidation.

[Printed, 1*s*. Drawings.]

A.D. 1861, December 6.—N° 3065. (* *)

SCHRAMM, Heinrich Gottfried.—(*Partly a communication from Edward Rösch.*)—" Improvements in rotatory engines and " pumps."

" An outer cylinder is employed with two end covers, suitably " constructed to receive a shaft or axis through their centres, the " passage of the shaft or axis through the covers being made " fluid-tight. . . . On the shaft or axis is fixed a cylinder suit- " ably formed for receiving hinged pistons or valves at its peri- " phery, and on the inner surfaces of one or both covers of the " main or outer cylinder grooves or guides are formed to draw or " move the hinged pistons or valves in towards the cylinder to " which they are hinged, and to move them outwards against " the inner surface of the main or outer cylinder, as required, the " valves or pistons being arranged to move into and from recesses " in the inner or rotating cylinder. Each valve or piston is " hinged or attached to the inner rotating cylinder at a distance " from the recess into and from which it is moved, a curved plate " perforated with holes being employed for this purpose ; one end " of the curved plate being hinged to the rotating cylinder, whilst " the other end of the plate projects beyond and is fixed to and " forms part of the valve or piston, and it is this end of the " curved plate which presses against the inner surface of the main " cylinder, in order to keep the valve or piston fluid-tight. The " ends of the pistons or valves work against the end covers of the " main cylinder. The curved plate, when its piston or valve is " within the recess of the rotating or inner cylinder, fits in a recess " formed in the surface of that cylinder, so that when that part of " the cylinder passes in contact with the stop or inner projection " which is *interposed between* the inlet and outlet passages, it " *acts as part of the surface* of the inner or rotating cylinder.

"When used for a rotatory pump, motion is communicated to "the shaft or axis, and the pump is furnished with an outlet and "an inlet pipe, the inlet pipe being in connection with a suction "pipe and having a valve in it opening inwards." "When the "engine is to be worked by steam or other fluid, so as to give "motion to the shaft or axis, then the steam or other fluid will "enter the outlet passage and pass away at the inlet passage."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 9.—N° 3083.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Charles Dickson Archibald.*—This invention relates (1) to "the "hydration or moistening of common air or other elastic fluids "to the extent of their capacity to retain and transport the "watery particles in the condition of vapour, when the same are "to be employed for purposes of motive power, in combination "with heated surfaces." The operation is effected by forcing water with intermittent pressure through small orifices or elongated flattened apertures, whence it issues in a condition approaching to fog or vapour; water thus comminuted and injected into a volume or current of air and steam, is at once absorbed, the operation being repeated until the requisite degree of moisture is attained.

2. Consists in circulating fluids, thus moistened, through heated chambers or spiral or other form of heated passages, under conditions that will allow of the dilatation or expansion of the whole volume at each stroke of the engine.

3. The construction (to be worked by such expanded fluids) of a single-acting trunk engine, in which the annular space around the trunk above the piston is employed as the air pump; when used with reciprocating action, a separate air pump is provided.

4. The construction and use of a movable fire-grate or furnace, capable of being simultaneously raised, lowered, or withdrawn, at the moment of starting or stopping the engine.

5. Consists "in the employment of a reciprocating rotary valve, "with moveable port lips adjustable by screws, to compensate for "friction and wear."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 12.—N° 3120.

JOBIN, JOSEPH DOMINIQUE.—This invention relates to locomotive engines, and is partly applicable to marine and stationary engines. It consists:—

1. In transmitting motion from the piston rods to the driving wheels by means of a self-acting lever clutch on the nave of the wheel, whereby when desired the connection between the wheel and the axle may be detached, in order that the machinery may rest whilst the wheel runs loose upon the axis. When the steam is on, the clutch is made to bind on the axle and nave, and attach them for the time being firmly together; but so soon as the steam is shut off and the action of the piston stopped, the lever clutch is drawn back and the parts are set free.

2. Constructing pistons in which the top disc or plate is permanently fixed to the piston rod, the other being secured thereon by screw bolts; the inner surfaces of the piston plates are recessed, wherein convolute springs are placed; the expanding pressure of these springs, acting against wedge shaped blocks fitted loosely between the segmental divisions which together form the packing rings, make the packing steam tight, and give a considerable amount of elasticity thereto.

3. Adapting to the backs of slide valves of steam engines, segmental or other suitably formed packing pieces, which by means of volute springs are kept up to the working face of the top plate of the valve; by this arrangement the polishing effect on surfaces in constant work is avoided, such surfaces when highly polished having a tendency to form a vacuum, and to stick together when the engine rests if not frequently lubricated.

4. Adapting to the lever of the safety valve a volute spring enclosed in a box; a rod and a tube are attached to the spring, the rod sliding inside the tube which is fixed to the boiler; the rod is attached to the weighted lever which retains the valve on its seat; a pointer on the rod indicates on a graduated scale on the outer tube the degree of pressure; the spring is kept wound up to a proper tension.

To prevent the slipping of the driving wheels of locomotive engines whilst ascending steep gradients, their peripheries are fitted with studs which are projected by springs against the rail or road.

[Printed, 10d. Drawing.]

A.D. 1861, December 13.—N° 3123.

HEWETT, STEPHEN BARBER.—This invention relates to the construction of steam boilers, generators, and evaporators, and to the pistons and other gear of pumps, also applicable to general purposes. The boilers vary in shape, and consist of arrangements within the external shell of a number of chambers, cells, tubes, or boxes, united by hot draught pipes or flues, and supported against external pressure by metal castings, so formed and arranged within the chambers, as to direct the flaming gases and hot draughts into repeated contact with the chamber sides, which are surrounded by water space. In some kinds of boilers the "cells, tubes, or boxes" are arranged in inclining horizontal tiers, connected together by bolts or stretchers so as mutually to support each other, the external form of their shells depending upon their internal arrangements. In other boilers, the internal fire spaces are stayed with bolts and rods in the usual manner. The invention with reference to pumps, consists, (1) in the use of a piston constructed in two parts, the lower is connected to the ordinary piston rod, and the upper part to a tube which encloses the piston rod; both are so connected to a crosshead as to admit of either being turned with the parts of the piston body respectively connected, which causes an outward expanding movement in the intermediate metallic packing, by means of teeth formed under the upper plate, which are actuated by pinions or pawls and ratchet wheels operating on screws and nuts. (2.) The use of a suction pipe with a worm rose plug so inserted within, that when sediment requires removal the plug is easily withdrawn. (3.) Working pumps by a crank with two throws, which give alternate action to the piston by means of cords or chains.

[Printed, 1s. Drawings.]

A.D. 1861, December 13.—N° 3126.

OLDING, HENRY JOHN.—This invention relates to a mode and apparatus for feeding steam boilers, and to raising and supplying fluids for other purposes; it consists of a closed vessel or chamber, so fixed near the boiler that its bottom shall be on the plane of the water level; on the top of the steam dome of the boiler there is a steam valve which opens downwards, and attached thereto suspended by a rod is a tubular ring float; a

steam pipe in which there is a stop cock opens a steam communication from the boiler to the top of the chamber through a valve box fitted thereon; a vertical water pipe opening into the chamber descends through the bottom down to below the boiler, where it turns and opens into a pipe leading from the well or reservoir, which pipe is united below the boiler to the feed valve, through which the feed water after having been drawn up into the chamber by a vacuum formed therein, is driven back down the vertical pipe into the boiler; when the water therein has attained its working level, the rising of the tubular ring float presses the steam valve up to its seating and closes the steam communication with the cistern. During the exhaustion of the water in the boiler the chamber cools, and as the steam therein condenses, a vacuum is formed sufficient to lift a stop valve at the top of the water pipe, draw water up from the well and nearly fill the chamber; when the water in the boiler has sunk sufficiently low, the float again opens the steam valve and admits the steam to the chamber, wherefrom, as soon as the accumulated steam pressure is in equilibrio with the pressure in the boiler, the water descends the vertical pipe by the force of its own gravity, lifts the feed valve and enters the boiler, these successive operations being kept up by the self-regulating action of the apparatus. The feed water valve chamber contains an "impinging valve," consisting of a plate valve and a plate of larger diameter on the same stem which works between friction springs. Air is admitted into the chamber by means of a hollow conical valve. The inventor prefers "to admit air and water into the boiler in such "proportions as to supply sufficient oxygen and water to prevent "the generation of explosive hydrogen gas."

Liquids are raised and supplied for other purposes by alternate vacuum and steam pressure pumps constructed on the principle described.

[Printed, 8*d*. Drawing.]

A.D. 1861, December 13.—N° 3140.

BROOMAN, Richard Archibald.—(*A communication from Felix Alexandre Testud de Beauregard.*)—The invention relates to apparatus for the production and application of motive power in steam *engines and locomotives*; it is based upon what the inventor *terms "the spontaneous* transformation of a liquid into an elastic

" fluid," or into dry steam at the moment of generation, and consists in the employment of a steam chamber or vaporizer, placed in the centre of a vertical cylindrical generator, and resting therein upon a bath or bed of mixed tin and lead, kept in a state of fusion by a furnace underneath. Water at a high temperature is introduced into the vaporizer in small quantities, and is instantly converted into steam, by contact with its heated metallic bottom; the steam is superheated or dried the moment it rises to the upper chamber spaces of the vaporizer and generator, which are surrounded by the flues wherein the flaming gases and products of combustion are draughting from the furnace. The steam having operated in the engine cylinder, passes through a "tubular " supply generator," where it heats the feed water to about 302° Fah., and thence to the condenser. The description is divided into seven parts. 1. The vaporizer floating on the metallic bath. 2. The use of the metallic bath. 3. The general arrangement of feeding apparatus. 4. The construction of a pyrometric whistle for indicating the maximum working heat point. 5. The construction of indicators for showing the temperature in the generators and condensers. 6. The tubular supply generator or water heater, and, 7. The tubular condenser. The supply of cold water to the condenser is regulated by a "ther- " mostat," made self-acting by the expansion of the liquid which it contains.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, December 13.—N° 3141. (* *)

BROOMAN, Richard Archibald.—(*A communication from Felix Alexandre Testud de Beauregard.*)—" Improvements in " blowers or apparatuses for superheating steam and other gases, " and for projecting them combined with atmospheric air upon " ignited combustible matter."

The invention "relates to the generation and employment of " dry and superheated steam at a temperature of about 390° " Fahrenheit, or of a gas, fixed or not, the pressure of which shall " be equal to what may be necessary for the particular application " for which it is to be used. This steam or gas is caused to " *escape* from an orifice by virtue of its compression into another " *orifice calculated* according to the quantity of air required in a " *given time*. The mixture of steam or gas and air is projected

" upon ignited combustible matter. There is then produced the " phenomenon of double decomposition. The air yields its " oxygen to the combustible matter to assist its combustion, and " the steam already divided will become decomposed into oxygen " and hydrogen, so as to produce the highest combustion." The apparatus for putting this invention into practice is termed the " aërhydric blower," and consists of a superheating vessel placed in and across a furnace, and having in it horizontal steam tubes, while other vertical tubes allow of the gases and products of combustion passing through them. The steam becomes superheated while traversing the horizontal tubes, and issues through an outlet pipe, the nozzle of which enters a tube, the mouth whereof is funnel-shaped. The section of the outlet pipe is calculated according to the quantity required in a unit of time, the distance of the nozzle from the mouth of the funnel varying with the increase of the pressure. The mouth of the funnel is also calculated according to the quantity of air to be introduced concurrently with the steam or gas in the same unit of time; the smallest opening is a section which will allow of the addition of the quantities of air and of steam or gas which are to be projected under the pressure necessary to the combustion to be obtained. There are cups in the superheated vessel containing metals or alloys of different degrees of fusibility which answer as pyrometers.

[Printed, 8*d*. Drawing.]

A.D. 1861, December 18.—N° 3168.

PERRIN, James.—(*Provisional protection only.*)—This invention relating to equilibrium valves, applies to that description of valve in use for diminishing steam pressure, or when used as a throttle valve, for regulating the supply to the cylinder. Two valves of the same diameter are fixed upon one spindle, and also a piston equal to one square inch of area; the top of the spindle is weighted, each weight indicating one lb. of steam pressure. " The piston works in a cylinder, and is acted upon by the steam " so as to balance the weights according to the pressure, and as " the valves are of equal diameters, this arrangemeat is perfectly " equilibrium. The valves are webbed, and work through holes, " and are bevilled, to allow the steam to pass freely and thereby

" prevent the shocks from sudden changes of pressure, which " generally occur with the ordinary flat valve."

[Printed, 4*d*. No Drawings.]

A.D. 1861, December 18.—N° 3173.

PIDDINGTON, John. — (*A communication from Wilhelm Winter.*)—This invention relates to condensing apparatus for steam engines. A hollow cylinder is employed, "to the lower " end of which a tube is fixed, and its other end connected to an " air pump; beneath the piston thereof, within the aforesaid " hollow vessel, are fixed two other vessels of smaller diameters; " the lower end of one vessel communicates by an outlet pipe " fitted with a cock, with a well or other water supply, and the " upper end of this vessel communicates with a perforated " hollow chamber formed around the upper part of the second " vessel, the lower end whereof extends to the feed pump of " boiler, beneath the piston thereof. The upper end of the " hollow cylinder aforesaid is fitted with a dome-shaped cover to " the top of which a bent pipe is fixed, said pipe being employed " to conduct the steam from the cylinder of the engine into the " condenser, the condensed water passing into a reservoir by a " cock fitted in a branch of the said bent pipe." "The air pump " being put in motion, forms a vacuum in the condenser and " causes water to enter thereinto and pass through the per- " forations in the vessel therein, and coming into contact with " the steam from the cylinder of the engine will condense the " same."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 21.—N° 3207.

GRIMALDI, Filippo.—This invention of rotary boilers relates to, and is supplemental to his former invention for the "instanta- " neous generation of steam," described in the Specification of Letters Patent dated August 9, 1860, N° 1927. It consists in internally fitting the rotary boiler with fire tubes, only leaving space for the steam and feeding pipes; or with four flues rectangularly placed round the centre of rotation; these flues may run straight through the centre of the boiler, or they may have

"one of their ends bent inside the boiler so as to open in the "circumference of the same."

Taking the steam as nearly as possible from the top space in the boiler, whilst the latter is rotating; the steam pipe enters through one of the trunnions, and bends upwards inside the boiler to within a short distance of the top. In those boilers which are fitted with tubes or flues, several radiating pipes are arranged inside the end of the boiler, which all open into the trunnion, into which the steam pipe is fitted steam tight; a passage into the steam pipe communicates separately with the radiating pipes as they successively come round to a vertical position above the trunnion, when the steam escapes for use.

Connecting by means of a tie rod inside the boiler, the steam and feed water pipes, which enter through the opposite trunnions, so that the pressure on one pipe shall counteract the pressure on the other. The safety valves and steam gauge, when there is no steam reservoir, are fitted on the steam pipe near the boiler. The water and steam gauge pipes enter through the trunnions within the steam or feeding pipes.

A movable perforated plate within the boiler is made to scrape calcareous deposits from the outer surfaces of the tubes.

The trunnions which support the boiler rotate on antifriction rollers fitted in the bearings.

It is arranged within the furnace, that the flaming gases shall first play all over the external surface of the boiler below the water line, and then course through the tubes or flues to the smoke chamber and chimney.

Marine boilers are enclosed in casings lined with fire brick.

[Printed, 10*d*. Drawing.]

A.D. 1861, December 21.—N° 3209.

ALLCHIN, William Loader, and ALLCHIN, William.—This invention relates to several arrangements of pipes or tubes and of apparatus for superheating steam.

The inventors say:—"For locomotive or portable boilers we "construct a series of tubes in a syphon or approximatively syphon "form, placed within the smoke-box and above the flue tubes of "steam boiler, this apparatus to be connected to the steam space "of the boiler, and also to a pipe through which the superheated "steam is conveyed to the cylinders of the steam engine. We

"also construct a double chamber or box of a D form, with an "outer and an inner casing, leaving sufficient space for the steam "between, and thus secure the action of the heated gases in the "smoke-box of boiler; and this box or chamber is connected to "the steam space of the boiler and to the cylinders of the engine. "In constructing stationary boilers, we connect a series of tubes "of convenient length in a syphon or approximatively syphon "form, placed within the flues or flue tubes of boiler. We also "connect one or more ends of these tubes to the steam space of "boiler, and to a pipe or pipes conveying the superheated steam "to the cylinders of the engine. We also construct a tube or "tubes, one within the other, the heated gases passing through "the inner tube and around the external portion of the outer "tube or tubes, the space between being occupied by the steam "to be superheated. We connect these tubes or pipes together "at each alternate end, or otherwise; or they may be all con-"nected together at one end to a pipe or pipes from the steam "space of boiler, the other end or ends being connected to the "steam pipe or pipes, so as to convey the superheated steam to the "cylinders of engines. For marine engines it will only be neces-"sary to modify the details of the above arrangements according "to the form of the boiler."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 21.—N° 3211.

SELBY, Fraser.—This invention relates to the construction of boilers and to superheating steam, an arrangement of cylinders and valves for compound engines, reducing vibration in locomotive engines, and to wheels on tramways.

1. The boilers are shown both upright cylindrical with hemispherical tops, and narrow box boilers with wagon-shaped tops; they consist of an outer shell and spacious inner furnace casing, surrounded by water space; a series of separate spiral coils are closely arranged vertically round the furnace, their lower ends open into the lower water space, and their upper ends into the water space near to the water level, so that when the flaming gases play over and between the bends of the coils, a separate upward water current is established in each. A group of superheating tubes is arranged within the steam space of the vertical boiler, through which the hot draughts course upwards to the chimney.

2. A high-pressure cylinder is concentrically placed within a low-pressure cylinder, which may, if desired, be centrally placed within a third cylinder; the piston in the low-pressure cylinder is annular, with two piston rods. The valves can be arranged to work with a single valve rod and excentric by means of a cross-head, or with a rod and excentric to each; the cranks may be opposite, or in a line, or arranged at any suitable angle. The steam works expansively in the high-pressure cylinder, which exhausts into the low-pressure cylinder. Two small cylinders may be employed by placing them at opposite sides of the large cylinder; in this case the piston rods of the small cylinders work on the outer throws of the crank.

3. When the transmission of motion from the crank to the driving axle of a paddle-wheel steamer, locomotive, or traction engine is effected by gearing, in order to prevent vibration, the driving axle is made in two lengths; the inner ends are fitted with balls, which work in socket joints on a swivel bearing, which permits an up-and-down separate movement to each half of the axle; the teeth of the wheels being shaped in relation to the centre of vibration, do not slip out of gear.

4. Sinking a V-groove into the periphery of the driving wheel of a locomotive or traction engine, to run on tram rods or rails with semicircular tops, and fixing flanges of a little less diameter on each side of the driving wheel of a road engine, to give support and additional tractive power to the wheel when running upon soft ground; also, fixing horse-shoe formed holding spurs on the peripheries of driving wheels.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1861, December 24.—Nº 3221.

NEWTON, Alfred Vincent.—(*A communication from Andrew Buchanan.*)—This invention for reducing the friction and wear of slide valves relates to the use and application of a modification of the well-known parallel motion, arranged within the steam box, to the slide valves of steam engines, whereby the valve is sustained and not pressed on its seat with the full weight due from the pressure of steam as it slides backwards and forwards therein, the friction being reduced to a minimum, and much of the wear of the surfaces prevented. The sides and ends of the valves are made sufficiently thin and corrugated to yield somewhat, so as to

compensate for the slight inaccuracies of the parallel motion. Instead of making the sides and ends of the valve thin and corrugated they may be made in the usual manner, and the upper plate made sufficiently thin to spring and yield to the pressure of steam. A mode of lifting the slide valve off its seating after the steam is cut off during the working of the engine forms part of the invention. The frames which support the parallel motion inside the steam chest rest on lugs cast thereto, to which it is so fastened by bolts that play is left for a slight vertical action. One end of the frame is suspended from a diaphragm fixed in the cover of the steam chest. The upward pressure of the steam against the diaphragm by its connection with the frame relieves the slide valve of a certain amount of steam pressure. The other end of the frame is attached to a vertical rod which projects through a steam-tight gland in the lid of the steam chest; it is jointed to a bell-crank lever, through which by a connecting rod the engineer is enabled to raise the slide valve off its seating.

Suggestions are made with regard to equivalent contrivances for elaborating the principles of the invention.

[Printed, 8*d*. Drawing.]

A.D. 1861, December 26.—N° 3234.

SHEPHERD, James.—This invention of "apparatus for "cleansing steam boilers" by collecting, carrying off, and discharging the scum, sludge, and sediment, consists in the use of one or more floating funnel-shaped receiving dishes, made buoyant by air-tight chambers and adjustable in regard to the working water level by balance weights. The tubular stems of these receiving dishes are made to rise and fall by sliding into vertical tubes which communicate with a horizontal pipe placed longitudinally near the bottom of the boiler. A series of inverted shallow funnels opening downwards, are fixed at intervals into the under side of the pipe which communicates with the outside of the boiler, where, by means of a blow-off cock, the scum from the surface of the ebullient water, which is collected by the floating receiving dishes, and the sludge and sediment drawn upwards from the bottom, into the pipe through the series of inverted funnels, are periodically discharged. The form of the receiving dishes may be varied.

[Printed, 10*d*. Drawing.]

A.D. 1861, December 26.—N° 3235.

NEEDHAM, Richard.—This invention relating to cleansing steam boilers, lubricating the pistons of steam engines, and a steam trap, consists, 1st. In placing a pipe extending the whole length along the interior near the bottom of the boiler, furnished at intervals along the top side with a series of vertical tubes, rising towards the water line, each carrying a funnel or scum dish facing towards the furnace end of the boiler, so that the wave of the ebullient water shall wash the scum therein; the still water within the tubes allows the particles forming the scum to sink into the longitudinal pipe, whence they are discharged by means of an outside pipe and a stop cock. 2. A tallow cup for lubricating pistons, wherein a ball clack is opportunely raised by the steam above the piston in the cylinder; the ball is fixed on a spindle which passes out through packing at the top of the cup; a thread and nut on the top of the spindle regulates the feed. 3. A "steam trap for steam pipes, steam cylinders, tape legs, or "other similar purposes. The vessel for receiving the condensed "water is suspended at one end by a socket or ball valve, through "which the water passes, and has at the bottom of the other end "an exit or equilibrium valve for the escape of the water when "the valve comes in contact with any fixed object. The vessel "is weighted and balanced so that it may receive a certain quan- "tity of water without changing its position, but when a larger "quantity has entered the weight is overbalanced, and the exit "end falls down so as to cause the exit valve to come in contact "with a fixed object, and thereby open it to allow the free escape "of the water."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 27.—N° 3239.

SILVER, Thomas.—This is an invention for governing the speed of steam or other engines, whereby advantage is taken of pneumatic resistance to the motion of rotating surfaces opposed to the reacting force of a regulating spring, and also the accumulation of pneumatic force within closed vessels, as a power operating against a reacting spring or counterweight. 1. Consists in fitting upon a spindle a pulley which turns thereon to a limited extent; also mounted upon a stud fixed in the side of the spindle

are two crossed levers with central bosses, which work loose upon the stud; the extreme ends of these levers are furnished with metal vanes, so placed as to present their full superficies to the resistance of the atmosphere when the spindle revolves; two connecting rods attached to a grooved slider upon the spindle are jointed to two limbs of the cross levers near the centre, and a helical spring is so placed between the end of the slider and an adjustable collar on the spindle, as to have the effect of constantly drawing the levers into a position inclining towards a parallel with the spindle; when the spindle revolves, the levers expand by centrifugal force; the action of the grooved slider is made to act upon levers and rods in connection with throttle and other valves. The apparatus may be employed for agitating the air of engine rooms.

2. The accumulation of pneumatic force within closed vessels operating against the reacting power of a spring or weight for governing engines. Two double acting air pumps driven by the machinery, one following the action of the other, are used to obtain a uniform pressure within a third single action receiving cylinder; the return action of the piston rod, which is connected to the throttle valve, is caused by the resistance of a spring or counterweight; the air is allowed to escape from the cylinder by opening an escape cock, in quantity equal to the quantity pumped in when the engine is running at a proper speed; in the escape cock passage there is a spring valve, so adjusted that on the emission of an increased volume of air from the escape cock, it will close and produce positive action on the piston, whereby the throttle valve will be more promptly closed. Many modifications are described, all acting on the principles involved, but more or less differing in details.

[Printed, 1*s*. Drawing.]

A.D. 1861, December 27.—N° 3244.

NEWTON, William Edward.—(*A communication from Rafael Rafael.*—(*Provisional protection only.*)—This invention relates to a steam generator, wherein a small quantity of water injected upon heated surfaces is instantly evaporated or flashed into steam. The quantity of water injected at each stroke of the piston must be just sufficient to supply the engine cylinder with a charge of

highly superheated steam for the succeeding stroke; the injection is made by the force pump at the moment of the commencement of the stroke when the ports are opening, coincident with the first contact between the water and the heating surfaces, which consist of a spiral coil of pipe, so placed in a furnace that the lower turns or bends of the coil shall be near the fire to be freely encircled by the burning gases, whilst the upper bends of the coil rise spirally towards the top of the furnace; the injection of water takes place at the top of the coil, by means of a small perforated pipe which is inserted therein, and around which the end of the spiral closes with a steam-tight joint. As the water descends the spiral, it gradually comes in contact with a higher degree of heat, until it flashes in a state of highly superheated steam through the lower bends, and onwards through the connecting steam pipe to the cylinder then opening to receive it. All sediment is carried off by the downward current. The generator may be attached to air or other thermo-dynamic engines, and the steam it generates be introduced therein as an auxiliary force.

[Printed, 4*d*. No Drawings.]

A.D. 1861, December 27.—N° 3246.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Alexandre Friedmann and Emile d'Erlanger.*) — This invention relating to steam boilers and furnace bars is supplementary to a prior communication for which Letters Patent were granted to this patentee bearing date November 5th, 1861, N° 2,778. It consists (1) of a new form of joint for closing the aperture connecting the water and steam spaces in the boiler with a water vessel in the furnace. The joint is a tube with two flanges occupying a front space between the wall of the furnace and the shell of the boiler to which the flanges are rivetted. The water vessel is placed within but quite independent of the furnace, being connected to the outer flange. 2. Consists in arranging the pipes and joints to form outside communications between the water vessel and the boiler spaces; and closing by movable plugs openings provided for inserting cleansing instruments into the water vessel when required; also connecting to the water vessel a cock for blowing off turbid water or deposit loosened by the use of the instruments, or otherwise. 3. Relates to furnace bars, which are arranged in two sets, and supported at one end upon a movable bearing bar

placed across the centre of the furnace, and so connected to a back cross-bar, that by means of rods and levers actuated by a screw handle within the reach of the fireman, the back set of furnace bars is raised or set on inclines, and made to discharge clinkers and other residue.

[Printed, 10*d*. Drawing.]

1862.

A.D. 1862, January 1.—N° 17.

GUTKNECHT, John Jacob.—This invention, relating to meters for measuring fluids, consists of a case constructed in halves, which are flanged round to correspond, so that when the flanges are bolted together an air-tight vessel is formed; interposed between the flanges is a flexible diaphragm, which, when the bolts are tightened up, completely divides the vessel into two air-tight compartments. A rod, which passes transversely through the centre of the vessel, enters at one side through a capsule made air-tight round the rod by a flexible membrane. Fixed upon the rod are two discs, which are bolted face to face with the diaphragm between them; sufficient surrounding flexible margin being left to permit the to and forth movements of the rod, which is supported at the other end by a suitable bearing, enclosed in a capsule at the opposite side of the box. Two inlet passages, leading from a valve chamber, open respectively into the two compartments, one on each side of the diaphragm, and between these passages on the valve surface is another passage through which the contents of the two compartments are alternately discharged. These passages are governed by an ordinary slide valve, which operates after the manner of a steam engine valve, opening the inlets to the two compartments alternately, and discharging the fluid from both through the intervening outflow. The to and forth movements of the rod act, by means of a segmental lever, in concert with the motions of the valve, and each throw of the rod acts upon a registering apparatus which exhibits by two fingers, on a graduated dial, the measured quantities which pass through the meter.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1862, January 4.—N° 34.

HOWDEN, JAMES.—This invention relates to valves of steam engines, air condensers, refrigerators, and boilers. A high-pressure cylinder is placed beside a low-pressure cylinder of larger diameter and longer stroke; the intervening space forms the valve box, containing a valve at each end coupled by a rod, which is operated between the parallel working valve faces of the two cylinders by one valve rod. The steam is first admitted to the high-pressure cylinder and exhausts from above the piston, through an independent passage in the valve direct into the low-pressure cylinder above its piston, which performs its downward stroke while the high-pressure piston is rising, and vice versa. One valve works all the admission and emission ports; it is relieved from steam pressure by a movable plate jointed thereto, as described in the Specification of a Patent granted to this inventor, bearing date November 21, 1860, N° 2,854.

A modification describes a double valve worked by one valve rod on one valve seating attached to the low-pressure cylinder; the steam passes first to the high-pressure cylinder and thence to the low-pressure as already described.

Cut-off valves, consisting of a plate or plates at the back surface of an ordinary slide valve, held in position by the steam pressure, and caused to stop or deviate from the direct course of the valve whilst in motion, by projecting pieces on the plate or plates coming in contact with fixed pieces on a rod, so arranged as to move the plates in the required direction; these rod pieces are capable of adjustment while the engine is at work.

Air surface condensers, constructed according to the said Specification, are so worked that the air shall pass through one half or section of the tubes in a contra-direction to the course of the steam between them, in order that the entering steam may impart its first heat to the departing current of air, which is forced through the tubes by a fan, and thence to the boiler furnace or where it may be utilized.

Refrigerators are constructed to cool injection water for re-use, by arranging the groups of tubes in separate sections, so that the water shall pass therethrough in succession, and the cooling water, by means of fixed wood partitions in the refrigerating chamber, is forced between the tubes in the same manner but in a contrary

direction. An air valve which closes when the water rises to it, is fixed on the top of the cistern for the free access of air.

Multitubular boilers, constructed according to the said Specification, are improved by making the tube chambers rectangular, with movable plates or doors for the purpose of cleaning out, and by securing such plates with rod bolts passed through the tubes; these rod bolts may be used in all cases for resisting pressure. Also using a scraping plate perforated to coincide with the holes in the tube plates; this plate is placed between the tube plates, the tubes passing through its perforations; it is for the purpose of removing from the outsides of the tubes all adhesive solid matter.

The remaining modifications refer to the disposition of the group of tubes and tube chambers, and with regard to the water spaces which are in communication with cylindrical vessels or steam chambers. The casing is formed of metal or brickwork. The flaming gases act first on the tubes over the fire by radiation, and then pass amongst the other groups of tubes, and away through a chimney flue at the base.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, January 10.—N° 80. (* *)

CLARK, William.—(*A communication from Louis Arnier.*)—
" Improvements in apparatus for generating and applying steam
" as a motive power."

1. Heating tubes in an inclined position in the arch of the furnace produce the steam.

2. Three cylinders work the same shaft with a three-throw crank, and one or two of these may receive the steam from the remainder so as to act by atmospheric pressure.

3. The exhaust steam on its way to the condenser heats the feed water, which is exposed to its action in small tubes.

4. The steam is superheated by passing through a cylinder in which are small tubes heated by the gases from the furnace as they pass to the chimney.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1862, January 11.—N° 85.

SCOTT, Thomas.—This invention relates to conjoint high and low pressure cylinder engines, also to a parallel motion. For

vertical action, the two cylinders stand side by side, and for horizontal motion the high-pressure cylinder is laid on the low-pressure cylinder, the piston rods working parallel in the same direction with reciprocating action on the ends of an oscillating beam. The large or low pressure cylinder is furnished with two piston rods connected by a crosshead, which is linked to one end of the beam. The high pressure or smaller cylinder works with one piston rod, connected to the opposite end of the beam by a parallel motion. The ports and steam passages communicate from the top of the high-pressure cylinder to the top of the low-pressure cylinder, and in a corresponding way at the bottom ports, the former exhausting into the latter, so that the pistons move simultaneously in opposite directions. The main connecting rod is coupled to the crosshead, which receives direct action from the low-pressure piston, but the power of the high-pressure piston only reaches the crosshead through the oscillating beam. The valves, ports, passages, pistons, and other parts are constructed in the ordinary manner.

[Printed, 10*d*. Drawing.]

A.D. 1862, January 13.—N° 92.

PARKER, John, WELLS, Joseph, and WELLS, Benjamin.—This invention relates to duplex rotatory steam engines, boilers, furnaces, and condensers. Three cylinders, internally communicating with each other, are cast together side by side; the intermediate cylinder is much smaller in diameter than the other two, in which rotating pistons are operated; each of the three cylinders contains a cylindrical drum corresponding with the diameter of the small cylinder, so that an annular space is formed in each large cylinder. The drums respectively are mounted on central axes, which work through stuffing boxes on the cylinder ends, and are geared together outside with wheels of equal size; the ends of the drums revolve internally against the cylinder ends and covers; a longitudinal groove is sunk along the side of the drum in the central cylinder, and a fixed piston plate is longitudinally fixed along the drum in each outside cylinder, each piston plate respectively extending from end to end, projecting and fitting with steam-tight frictional contact against the inner surface of the cylinders, thereby forming a longitudinal division along the annular space in each. As the drums (the sides of which are in

contact with the central drum) are forced round by the pressure of the steam against one side of the piston plates, the latter fall in succession into the longitudinal groove in the central drum, which revolves in an opposite direction. Steam is alternately admitted to the annular spaces in the large cylinders through a double-action conical equilibrium valve at suitable junctures, so as to act upon their respective piston plates immediately after they are clear of the longitudinal groove in the small drum. The steam can be cut off at any point in the revolution, working expansively for the remainder, and then conducted to a surface condenser, which consists of a series of plates arranged to form a series of chambers communicating with each other within a case, wherethrough a constant current of cold water is kept up. Other arrangements of surface condensers are described, including a mode of fixing metal tubes into surface condensers of different construction. With regard to steam boilers, jets of steam are introduced for assisting combustion, increasing the heat, and accelerating the current of the flaming gases through the tubes. The door frames, dead plates, and fire-bars are made hollow for the passage of air, also introduced to assist combustion. Steam is conducted from the boiler through superheating coils of pipes disposed in the flues. Self-acting apparatus is provided for operating the steam taps and air dampers; the cylinders and pipes, to prevent loss of heat by radiation or conduction, are surrounded with casing, and the intermediate space filled with non-heat conducting material.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, January 16.—N° 119.

MONCKTON, Edward Henry Cradock.—This invention for obtaining and applying motive power consists in rapidly generating steam by the circulation in small quantities, by means of a force pump, of pure water or other fluid, gas, air, or mercury, through flattened metal tubes formed to resist pressure, properly stayed and supported, and heated over a fire in a furnace; these, tubes are also arranged to form the grate bars, and some of them may be placed in the body of the fire to act as superheaters; within the furnace they may be disposed in gridiron form, one set above another, or in vertical groups, or spirals waved or serpentine, but all must be in communication at one end with the force pump,

and at the other end with a steam reservoir or directly with the engine cylinder, where after operating the piston, the steam passes thence into a condenser, consisting of a series of flattened tubes, or of flat vessels placed in a case, into which amongst the tubes or vessels, currents of air or water are introduced by means of a force pump; also water in showery particles may be used in combination with an air blast. The water of condensation is returned to the water reservoir to be again pumped into the boiler. When air or gas is used instead of water and fluids, it is necessary that the apparatus be rendered suitable as regards the nature of materials, to receive the peculiar agents, and it may be hermetically closed; such motive agents might be condensed to the pressure of several atmospheres, in which state but little heat would be required to give them the necessary degree of expansion.

It is preferred that the metal tubes be coated with gold, silver, aluminium, or other suitable metal.

[Printed, 6*d*. No Drawings.]

A.D. 1862, January 17.—N° 129.

ROMAINE, Robert.—This invention relates to appliances for use in steam-power land culture, and in boilers for agricultural and tractive purposes. It is supplementary to a previous invention by this patentee, described in the Specification of a patent granted to him in 1859, N° 1229, which consists of a system of steam cultivation by means of traction ropes, and of apparatus for carrying and controlling them. The improvements embodied in the present invention consist :—

1. In arrangements whereby the traction rope is made to control the slack rope. This object is effected by two sheave pulleys on the snatch-block frame; small rollers are employed to press the convolutions of the rope into place round the pulley grooves; reverse action is given to the pulleys by means of a bevel pinion loose on a stud shaft, gearing into two bevel wheels on the pulley shaft, either of which at pleasure can, by means of a friction clutch, be thrown out of gear while the other continues revolving, whereby the action of the apparatus can be reversed and at any time the slack may be taken up. There are modifications to attain the same object described in respect to this part of the invention.

2. Employing in a winding apparatus three V-shaped grooved sheaves, but instead of arranging them as formerly described on horizontal axes, they are now geared together and placed on vertical axes alongside the steam engine.

3. Relates to the construction of a duplex plough frame and a double series of ploughs, all of which point to the centre of the frame, and act separately in alternate directions, one set being raised while the other operates, and vice versâ.

4. Relates to the construction of a dead anchor for resisting the draught of cultivating implements as they are drawn through the surface of the ground.

5. Relates to a mode of preventing accidents which arise when the water level in a boiler sinks below the crown of the fire-box. The inner crown plate is dispensed with, and the furnace is open to the top, and there closed by a convex metal cover, up to which the surrounding water spaces extend; within the furnace, below the water level, there is a fire-brick counter roof or diaphragm which rests on angle iron brackets bolted and secured to the sides of the furnace; the space above is occupied by a separate steam reservoir or chamber placed within the walls of the furnace and in communication with the steam space in the boiler, which is of the tubular class.

[Printed, 3*s.* 6*d.* Drawings.]

A.D. 1862, January 20.—N° 143. (* *)

JOBLING, Thomas William.—Improvements in getting rid of the exhaust steam and smoke in steam engines to be used in mines.

"The coke or other fuel before being supplied to the fire-box
" of the locomotive engine is heated in a stationary furnace
" adapted for that purpose, and the water previously to being fed
" into the boiler of the locomotive engine is heated in a separate
" stationary boiler, either connected with the furnace above-
" named or not, as may be preferred, and in such heated state it is
" supplied or fed into the locomotive boiler.

"The exhaust steam and the heated air and other gaseous pro-
" ducts of combustion, instead of passing out of the chimney
" into the atmosphere in the usual way, are condensed by being
" passed over a surface of cold water contained in a condensing
" tank attached to the locomotive engine for that purpose, and

" thence through a coiled or tortuous pipe placed in the tank
" (amongst the water) to the outside."

[Printed, 6d. Drawing.]

A.D. 1862, January 21.—N° 153.

BINKS, Christopher.—This invention relates to particular modes of generating steam in closed vessels for use as a motive power, and in open vessels for other purposes. It consists, 1, in the direct application of the gaseous and volatile products of the combustion, in atmospheric air, of carbonaceous fuel, consisting chiefly of carbonic acid, carbonic oxide, and nitrogen. Whilst these products are at the highest temperature, they are brought into actual contact with the water, either to impinge upon its surface, be projected into the body of water, or mingled with it in a state of misty spray. The atmospheric air is passed through ignited fuel within a retort or combustion chamber furnished with suitable apparatus for re-charging and forcing the heated products through, upon, or otherwise into direct contact with the water. 2. Consists in vaporizing water by the direct application of heat developed by the combustion of a mixture of oxygen and hydrogen gas; this gaseous mixture is projected in small quantities into the water, and there by an electric spark, or other contrivance, ignited whilst in actual contact. The product of the combustion of pure oxygen and hydrogen gases is water in the form of highly heated vapour, which is thus brought into contact with the body of water, and so causes its vaporization. Other inflammable gaseous compounds in suitable proportions are used for the same purpose. 3. Relates to the use of steam, superheated by any of the ordinary superheating apparatus, or by commingling therewith highly heated products of combustion, for generating fresh steam from water heated by contact with such superheated steam alone or mixed with highly heated gaseous compounds. 4. Consists in effecting the conversion of water into steam by first decomposing a portion of such water, and producing therefrom, by the action of voltaic electricity, the two gases, hydrogen and oxygen, and then by a further application of the same agency, their combustion is effected and attended with the resultant evolution of great heat; in this manner the whole body of water is progressively converted into steam. Magneto-electricity and other modifications of electric action may be resorted to.

[Printed, 6d. No Drawings.]

A.D. 1862, January 22.—N° 167.

BEER, Alfred James.—This invention relates to those valves of steam or other engines which carry little or no steam pressure, thereby avoiding wear and friction. The valve consists of a shallow cylinder with a deep rectangular flange round the lower part or base, the end of which forms the valve facing; near to the top there is an outside annular groove to contain packing; a loose ring is fitted round the top, which covers the packing, and is made steam-tight thereby; when the valve moves to and fro on its seating, the upper edge of the ring, which stands above the circular rim of the valve, slides against the under side of the valve box cover, in which position it is maintained by the upward pressure of four helical springs, which are supported in vertical sockets sunk outside the cylindrical part of the valve into the flange. The body of the valve box is open to the steam supply pipe, and in some cases the exhaust pipe is mounted upon the cover of the valve box, so that the steam after having operated the pistons is emitted through the valve. On the back of a valve so constructed, there is little or no weight of steam pressure. The valve is secured by a bridle to the valve rod, which works through a stuffing box in the usual way actuated by excentrics or otherwise.

Two sets of valves may be worked in one valve box fitted between two cylinders combined for conjoint action. In this case the valve box is divided by a longitudinal plate, which sustains on its two sides the pressure of both valves; and the cylinders may exhaust through ordinary exhaust ports, or through passages formed in the sustaining plate. The above mode of construction may be modified where two valves work in one valve box, by securing the back sustaining plate to the loose ring of one valve, and allowing the annular top surface of the other valve to slide against the other side of the plate, suitable springs being interposed between the valves to keep them down on their respective facings.

[Printed, 10*d*. Drawing.]

A.D. 1862, January 23.—N° 178. (* *)

RIPLEY, Abraham.—"Improvements in the construction of "pistons."

This invention, which is equally applicable to the pistons of steam cylinders, of pumps, and to pump buckets, consists of a

piston "composed of the usual plates, having the ordinary seg-"mental rings, or rings with one slit through, placed between; on "each face of the piston is an orifice passing through the plate "into the interior. Passing through these orifices, and working "steam-tight in them, are two small spindles or studs, each of "which terminates in a conical wedge, or its equivalent, which in "turn fits into and works within a corresponding hollow cone or "seat. This seat is formed in two parts, and each part is attached "to a segment of the ring, so that when the exterior of the piston "is acted upon by the steam in the cylinder, pressure from the "same cause is given to the heads of the small studs, the inner "conical ends of which force asunder the parts of the hollow "conical seats. These parts being attached to the segments of the "packing rings cause them to expand wider and press against the "sides of the cylinder. . . . I propose also to effect the same "action upon the rings by forming the spindles to terminate in a "wedge, one face being parallel and the other oblique, and acting "upon a seating similar in its functions to the last-mentioned one, "but having its faces parallel. . . . I propose to render the studs "or spindles steam-tight by means of a small gland and stuffing "box fitted into the face of the piston. . . . or I effect the same "by covering the head of the stud or spindle with an air-tight "metallic or other elastic diaphragm or membrane."

[Printed, 8*d*. Drawing.]

A.D. 1862, January 24.—N° 181.

WILLIAMSON, ALEXANDER WILLIAM.—(*Provisional protection only.*)—This invention relates to steam generators formed by parallel sets or sheets of water tubes, bounded at each end by a cross tube with which all the tubes in the set communicate; these sets of tubes are closely disposed one set above another within an enclosed furnace, and so arranged that the tubes in each set shall be over the intermediate spaces between the tubes in the set immediately beneath; so that as the flaming gases rise from the fire amongst the tubes, they shall strike full against each tube in succession, and be made to take a waving upward course instead of a straight one, which would be the case if the tubes in each set were placed immediately over the tubes below. The tubes are connected, and communicate laterally with each other in the

course of their length, in addition to the general tubular communication at each end. These sheets or sets of tubes are sometimes arranged side by side in a vertical position, and the flaming products of combustion made to pass to and fro amongst them. All the cross tubes at one end of each set are connected with the water feed pipe, and all the cross tubes on the opposite end communicate with the steam chamber above, in which the water level is maintained. Various arrangements as regards the locality and form of fire-grate are suggested.

[Printed 4*d*. No Drawings.]

A.D. 1862, January 25.—N° 196.

JOHNSON, JOHN HENRY.—(*A communication from Stanislas Michel Lecacheux and Bernard Sartre.*)—This invention relates to removing and preventing incrustation in steam boilers by the use of a liquid composed of eight parts by weight of potash or carbonate of potash, from two to eight parts by weight of molasses, and one hundred parts by weight of snail or slug liquor, boiled together for two hours and then strained for use. This liquid when introduced into the boiler prevents and removes incrustation, by destroying or neutralizing the adhesiveness of calcareous or other particles precipitated by the ebullition of the water, and those which constitute the residual products of evaporation. The proportions given above may be varied. The liquor is injected into the boiler by means of the steam pressure and its own gravity. A small closed vessel is conveniently fixed above the water level of the boiler; three double-flanged cocks are mounted on the top of this vessel, and another is fixed near the bottom, through which by means of a down pipe there is a communication with the water spaces in the boiler; a funnel is mounted on one of the top cocks, a vent pipe on the second, and the third, by means of a connecting pipe, opens therethrough to the boiler steam space. When it is desired to inject the liquid into the boiler, the cocks being all closed the first to be opened is the vent cock, and next the funnel cock, through which the proper quantity of liquor is poured into the vessel; those two cocks are then closed and the steam cock opened, which admits the steam to the vessel above the liquor; as soon as the steam pressure in the vessel is equal to *the pressure in* the boiler, the bottom cock which leads into the

down pipe is opened, when the liquor begins to run down into the boiler. The vessel being emptied the down cock is first closed and then the steam cock to await the next operation.

[Printed, 6*d*. Drawing.]

A.D. 1862, January 28.—N° 216.

HANKINS, JAMES. — (*Provisional protection only.*) — This invention relates to a liquid composition to be applied to marine and other steam boilers to prevent incrustation. The composition or wash consists of the following ingredients, mixed and prepared in the manner herein stated :—" Take spirit of salt (hydro-" chloric acid) and add potash and soap makers' alkali, then add " zinc, and continue adding it until the acid becomes neutralized " or until it ceases to boil or effervesce, allow it to cool and settle, " then decant the clear liquid. This liquid applied with a brush " on the interior of boilers effectually prevents incrustation, and " at the same time preserves the boilers."

[Printed, 4*d*. No Drawings.]

A.D. 1862, January 28.—N° 218.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Jacques Belou.*)—This invention relates to engines actuated by heated air, or by air and steam combined. It consists in adapting the piston of a single-acting engine to the double purpose of on one side drawing in and forcing the atmosphere into the heating furnace, and on the other side to the motive power of the heated air; the capacity of the cylinder on one side of the piston is made to correspond with the volume of a given quantity of air in its cold natural state, and on the other side to the volume of the same quantity when heated and expanded. To effect this, the piston is fitted to a trunk of considerable size, which works through a stuffing box in the cylinder cover; the connecting rod is jointed to the piston at the bottom end of the trunk; the annular space round the trunk is equal to contain the given quantity of cool air required at each stroke of the piston; this end of the cylinder is fitted with a suction valve for the admission of air, and an emission valve which opens when the air is forced out towards the furnace and closes with the back pressure. The lower end of the cylinder below the piston is all open space; it is fitted with two valves, one for induction, which opens

to admit the heated air under the piston, and the other as an outlet valve for the exhaust. Double-action engines may be arranged on this principle, by coupling end to end two single-acting cylinders, and working with two pistons on one piston rod, upon which between the pistons is concentrically interposed a metal tube of the same relative proportionate diameter as explained with regard to the volume of air at its natural temperature and in its heated state; this piston tube works through a stuffing box interposed between the united ends of the cylinders, over which is placed an air-tight vessel divided into two compartments, each of which is fitted with a suction valve for the admission of air, and an emission valve which opens when the air is forced through into the furnace, and closes with the back pressure; these two compartments communicate separately with the cylinder ends; the annular space formed by the piston tube in each cylinder is filled with oil or other suitable liquid, which as the piston alternately comes home to the united ends of the cylinders, is driven up into its respective compartment and forces the air through the emission valve; on the reverse movement of the piston the liquid sinks and draws in the air; the outer ends of the cylinders are fitted with the necessary valves and work the motive power. The cooling of the cylinders after every stroke of the pistons is a very important advantage gained.

[Printed, 8*d*. Drawing.]

A.D. 1862, January 28.—N° 226.

NEWTON, WILLIAM EDWARD.—(*A communication from Wellington Lee.*)—This invention relates to engines for pumping and forcing fluids, and to other purposes requiring rectilinear motion. The invention for which Letters Patent, bearing date September 28, 1861, No. 2422, were granted to John Adams Knight, being a communication from the above Wellington Lee, is referred to. The present invention, amongst other things, consists in a novel mode of working the valve gear of pumping engines. Two pumping cylinders are lineally connected to the pistons of two steam working cylinders, which are fitted with separate valve gear, so arranged that by means of short levers and adjustable tappets on the piston rods the induction ports of each cylinder respectively are opened by the tappets on the piston rod of the *other* cylinder, but the closing of the induction ports and opening

the exhaust is effected for each cylinder by its own piston rod, which by means of suitable arms and levers acts upon the stem of its own valve. The invention also consists in employing one induction and one eduction port at each end of the cylinder, and the usual exhaust port common to both eduction ports, which are closed before the end of the stroke, so that a portion of the steam may be left to form a steam cushion. It consists also in the construction of a double action pump, the case of which is closed at both ends, and may be rectangular or of other convenient shape. At the mid-length inside of the pump case there is a projecting flange, forming a circular passage between the two ends, in which a double truncated piston works; each end of the pump case is furnished with a series of puppet valves opening inwards, which take in water from a cistern underneath, and with another series of puppet valves which open outwards, wherethrough the water is expelled; one side of the piston alternately drawing water into one compartment, while the other side is driving water out.

[Printed, 1s. Drawing.]

A.D. 1862, January 29.—N° 234.

MERITON, Thomas.—This invention relates to marine and other steam boilers. Two examples of its application to marine boilers are shown, and one as applied to an upright cylindrical boiler. It consists in the use of a vertical group of water tubes placed in the combustion chamber at the back of the boiler, which contains horizontal clusters of return fire-tubes over the furnaces, opening into the smoke chamber in front leading to the up-take. The ends of the vertical tubes are fitted respectively into the plates which form the top and bottom of the combustion chamber, wherein the tubes are grouped in the back part, so as to leave sufficient space before the mouths of the return fire-tubes; this space is so divided by a horizontal partition, that when the flaming gases and burning products have passed the bridge, it directs their course in amongst the lower ends of the vertical tubes and upwards between them, passing out above the partition and across the space and through the return fire-tubes to the smoke box and uptake. In the other example of marine boiler, the arrangements in the back combustion chamber, which extends low down in the boiler, differ, there being a transverse rectangular extension of the back water space projecting forwards into the water chamber; the

vertical tubes are fitted respectively into the top and bottom plates of this rectangular projection, and by means of the horizontal partition, the course of the heat current is directed into the lower ends of the tubes (which in this case are surrounded with water) passing from their upper ends into the return tubes to the smoke chamber in front. The vertical tubes in the vertical boiler are disposed in an annular group round the interior of a frustrum formed flue chamber concentrically placed above the furnace which opens into it; the chimney, which descends centrally through the convex crown of the boiler and steam space, is connected to the top of the flue chamber, in the centre of which there is a superheating lozenge-shaped vessel which deflects the burning gases divergently amongst the annular group of tubes.

[Printed, 8*d*. Drawing.]

A.D. 1862, January 30.—N° 246.

RIPPINGILLE, Edward Alexander.—This invention is applicable to steam engines constructed with a small auxiliary cylinder and piston, wherein the injection water current is made to operate on its passage to the condenser. It consists:—1. In applying an elastic piston in the injection cylinder to prevent concussion at the end of the stroke and when the valve port is covered, and causing one side of the piston to act as an air pump. 2. Applying a chamber to the condenser for receiving the intermittent flow of condensing water from the pump, and delivering it to the condenser in a continuous stream through suitable jet pipes. 3. Applying apparatus for refrigerating the water of condensation from a steam engine, in combination with an injection cylinder. 4. Consists in a combined arrangement of air pump and injection cylinder or engine, for withdrawing air from and supplying injection water to the condenser, acting in combination with the water pump which withdraws the condensing water and the water of condensation. 5. Relates to the construction of surface condensers, which consists in so dividing the space contained within a cylindrical casing by corrugated sheet copper concentric partitions, that communicating annular narrow passages are formed in the condenser for the condensing water, which is admitted at the top, the intermediate passages being for the steam. The condensing and condensed water flow out at the bottom through separate openings.

[Printed, 10*d*. Drawing.]

A.D. 1862, February 1.—N° 272.

PENDLEBURY, Jonathan.—(*Provisional protection only.*)—This invention relates to an apparatus and mode of lubricating steam engine cylinders, slides, and other surfaces. It consists in mounting a small vertical cylinder upon the top of a pipe which communicates internally with the bottom of the engine cylinder; a cup for holding a liquid lubricant is fixed upon the small cylinder, which contains "a double piston with a plug between them, "which is hollowed in a concave form. The interior of the small "cylinder is in communication with the steam cylinder by means "of tubes or pipes. When the piston is at the bottom of the "steam cylinder, the pipe communicating with the small cylinder "is closed. When the piston is ascending steam passes through "the pipe into the small cylinder, and raises the double piston "above the orifice which leads to the steam cylinder, into which "the lubricating matter is forced by the pressure of the atmo-"sphere. When the piston is at the top of the steam cylinder, "and a vacuum below, the double piston in the small cylinder "descends by atmospheric pressure, and again opens the orifice "leading to the steam cylinder into which the lubricating matter "enters as before." The action of the small cylinder is modified "by substituting for the steam and atmospheric pressure a lever, "weight, or spring," and employing "a valve instead of the "double piston, so as to adapt the apparatus for lubricating "slides or other surfaces when there is no steam or vacuum."

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 5.—N° 299.

GALLAFENT, Daniel.—This invention relates to generating or producing elastic vapours for motive power, and consists in obtaining a combined mixture of hot air and steam for use in high-pressure engines, by forcing the heated gaseous products of combustion out of a closed furnace into the water space below the water level in the boiler, so that the water may be heated by the direct application of the heat of the fire as well as by conduction through the furnace plates. The openings into the furnace, the ash-pit, and the chimney flue, are so constructed that after the fire has been lighted and steam got up in the usual way, they can be effectually closed against internal pressure and made air-tight; air is then, by means of an air pump, forced through a pipe into

the ash-pit for supporting combustion, and the only outlet for the flaming products thereof is through a circular row of apertures below the water level in the uptake, which passes from the furnace up through the water and steam spaces of the boiler; each of these apertures is furnished with a short tube, which diverges laterally from the uptake into the water; and fitted at the end of each tube there is a small back pressure valve, which closes whenever the pressure in the boiler is superior to the force of the gaseous outflow, whereby any escape of water into the furnace is prevented. "It will be manifest that to supply the "furnace with a fresh charge of fuel, the cover" which closes the opening thereto "must be removed, but it is not anticipated that "such an operation will be required more than two or three "times a day."

[Printed, 8*d*. Drawing.]

A.D. 1862, February 5.—N° 307.

LEE, Jesse.—(*Provisional protection only.*)—This invention, relating to tractive engines consists in placing the axle whereon the tractive wheels of the engine are mounted, about the mid length of the boiler, so that the boiler, which is supported thereby, can be equably balanced at all times by the aid of a lever, conveniently arranged within reach, whereby the level is adjusted and maintained while the engine is ascending or descending the inclining surfaces of the road or way upon which it travels.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 6.—N° 310.

CALOW, Charles, and HIRST, John William.—(*Provisional protection only.*)—This invention, relating to slide valves for steam engines and similar purposes, consists in a mode of equalizing the pressure of steam or fluid on a slide valve, which will be perfectly tight on its seating while moving to and fro with ease. "In the inside of the valve box, and at the top of the "slide, there is a plate equal to the surface of the valve, and at "the top of this plate there is another plate acted upon by "adjusting screws, eccentrics, or cams, so as to keep the valve "tight, but exert no pressure. In the second plate, opposite the "induction ports, there are recesses or spaces which allow the "steam or fluid to pass to the top of the slide to an extent equal

"to the area of the port, and in the valve there are holes for "enabling the steam or fluid to pass back again into the exhaust, "which arrangement causes an equilibrium of pressure during "the entire stroke, and enables the valve to be worked with "ease."

[Printed, 4d. No Drawings.]

A.D. 1862, February 8.—N° 333.

HOWIE, JOHN.—(*Provisional protection only.*)—This invention, relating to the consumption of fuel in furnaces, consists in conducting by means of a small pipe, a portion of steam from the boiler to the ash-pit, where it is allowed to escape and spread beneath the furnace bars, in order that it may be drawn up by, and pass through the burning fuel with the draught. Instead of taking steam from the boiler, the whole or a sufficient portion of the exhaust steam from the engine may be directed into the ash-pit, to be diffused amongst the burning fuel, and in some cases a portion might be allowed to pass into the furnace otherwise than through the furnace bars.

[Printed, 4d. No Drawings.]

A.D. 1862, February 11.—N° 352.

BONELL, CORNELIUS, and SPIRING, WILLIAM MORTIMER.—(*Provisional protection only.*)—This invention consists of a rotary engine to be worked by steam or other vapour or gas. The cylinder of the engine is stationary, and in transverse section is slightly elliptical; the main shaft passes through and rests in bearings at each end of the cylinder, placed eccentric to its centre; an elastic packing which fills the annular space on the shortest radius is attached to the cylinder, and bears steam-tight upon the shaft, which is within the cylinder divided by a longitudinal mortice, wherein a plate which acts the part of a piston, slides to and fro, always bearing at each end on opposite sides against the internal surface of the cylinder, so as to effectually divide the crescent-formed space round the shaft and constitute self-adjusting surfaces for the expansive force of the steam to act upon. An ordinary slide valve regulates the supply of steam, which by pressing upon one side of the projecting ends of the piston plate gives rotary motion to the shaft; the steam admission port is situated on one side of the elastic packing and the exhausting

port on the other; a slight depression is made in the cylinder surface where the steam enters, so that the ends of the piston plate may alternately pass lightly over the port; a small portion of steam will consequently escape, which, by acting on the other part of the piston, carries it over what would otherwise be a dead centre. The direction of rotation may be changed by the usual appliances connected with the slide valve.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 11.—N° 354.

MACNAB, William.—This invention relates to arrangements of the parts of marine steam engines combining high and low pressure cylinders, and to a mode of superheating the steam after it has operated the high-pressure pistons during its passage to the low-pressure cylinders; for which purpose, highly superheated steam before entering the high-pressure cylinder is made to pass into a series of piping disposed inside the low-pressure eduction passage or chamber, where by conduction through the metal of the piping it imparts a certain portion of its heat to the interfluent steam then passing from the high to the low pressure cylinder. The following is the arrangement of parts of marine engines for the conjoint action of high and low pressure cylinders:—Four cylinders are employed, two working high-pressure steam and exhausting into the other two cylinders, which are low-pressure and of much larger capacity; these four cylinders are horizontally disposed, a high and a low pressure cylinder on each side of a two-throw crank at right angles therewith, so that a high and a low pressure piston shall operate on each throw of the crank. The low-pressure cylinders are fitted with piston trunks, which work through stuffing boxes at both ends; the connecting rods are jointed within the trunks and coupled to the crank throws. Mounted on each high-pressure piston rod there is a crosshead, which is connected to the low-pressure piston by two rods that work through stuffing boxes in the cylinder covers, so that the power of the high-pressure pistons passes through the low-pressure pistons and connecting rods to the respective crank throws. All the cylinders, covers, and steam passages are enclosed within steam jackets. The crank shaft works in four bearings disposed on the engine framing, two between the crank throws and two *outside*. The excentrics for working the low-pressure valves are

upon the crank shaft between the central bearings, and those for working the high-pressure are respectively between the central bearings and the crank throws. Surface condensers are employed; they are placed against the forward end of the engines, whilst the air, feed, bilge, and circulating pumps are worked by a prolongation of the crank shaft.

The above arrangements may be applied to engines which work vertically or on inclines.

[Printed, 10*d*. Drawing.]

A.D. 1862, February 12.—N° 365.

TOLHAUSEN, FREDERICK. — (*A communication from Jean Larmanjat.*)—This invention relates to the construction of vertical steam boilers, with a view to increase heating surface, economize fuel, and consume smoke. The lower part of the body of the boiler consists of a circular chamber, widening upwards to about two-thirds of the total height, where it is concentrically united to the upper part of the boiler, which is cylindrical with a truncated cone or frustrum formed bottom; the boiler is disposed over a brickwork furnace, and is encircled with brickwork flues, within which, vertically bisecting the flue space round the lower circular chamber, is placed an annular water chamber, which communicates by pipes with the body of the boiler. The flaming gases and products of combustion pass up between the central cylinder and the annular chamber, then strike against the truncated cone bottom, and descend between the outside of the annular chamber and the surrounding flue into the chimney passage. All the parts are in communication.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 12.—N° 367.

BRICKHILL, JAMES.—This invention relates to the cylinders and pistons of horizontal steam engines, the object being to do away with or prevent the wear and friction caused by the weight of the piston upon the lower side of the internal surface of the cylinder and the consequent leakage and loss of steam. It consists in forming a longitudinal groove along the surface of the cylinder directly under and parallel with its axis, and fitting into this groove a long bar or slide slightly tapering on the up side, which

partly stands out of the face of the cylinder and forms a projecting incline. Along the centre of this inclined surface there is a tongue formed by reducing the solid metal on each side, upon which another bar with a corresponding groove along an inclined surface is fitted on the tongue, which brings the up side of the top bar level with the cylinder. The sliding bar is united to a rod which passes out through a small stuffing box in the cylinder cover. The end of this rod is screwed and fitted with an adjusting and a lock nut. The square part of the bar does not extend the whole internal length of the cylinder, but the upper bar fits easily between the cylinder ends without end play. A corresponding space is made across the periphery of the piston, in which there is a small antifriction roller fitted to run and bear upon the upper bar. The piston is packed by means of two half rings of metal which abut against the sides of the inclined bars and are expanded by a wedge. Packings are provided for keeping the surfaces steam tight. When the piston or parts wear it is compensated by the adjustment nut, which causes the sliding bar to move endways in the groove, and by means of the inclined surfaces raise or depress the upper surface of the inner bar to the desired level.

Slight modifications of the principle are described.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 12.—N° 372.

SPENCER, Thomas.—This invention relates to apparatus for propelling vessels, and to a rotary engine for actuating the same, which is partly applicable to other purposes. The propeller, which may be used as a substitute for an under shot water wheel, " consists of a number of paddle floats, each formed with three long " narrow leaves or feathers radiating from the longitudinal face " of an axle or common centre, and fixed at an angle of 120° to " each other. These paddles I mount loosely on their longitudinal " axis parallel to each other, having their bearings at each end " supported on two endless chains, which are stretched out in an " horizontal direction, and work over pulleys. The outer pair of " pulleys I mount in moveable bearings, so that the outer or " stern end of the apparatus may be lowered down or elevated at " pleasure, according to the load draught of the vessel. This

" propelling apparatus I place in a well or recess formed in the " stern of the vessel to which it is applied. The driving power I " use to actuate the propelling apparatus consists of a rotary " steam engine, having a fixed cylinder consisting of a hollow " ring, in which revolves one or more pistons mounted on radial " arms springing from a centre transverse shaft, having its axis " in the centre of the so formed cylinder. The cylinder is fitted " with one, two, or more inlet and one, two, or more outlet valves. " I introduce a sliding diaphragm between each inlet and outlet " valve, forming surface pieces dividing the cylinder, and the " sides of which act alternately as an abuting surface for the " steam and to divide it from the exhaust. These sliding dia- " phragms are actuated from the centre shafts by a cam or " excentric motion. The engine I connect to the propelling " apparatus by a cog wheel keyed on to the centre shaft, from " which the radial arms carrying the pistons spring, and which " gears into a second cog wheel on the shaft containing the two " inner pullies, over which the endless chains carrying the pro- " peller floats work."

[Printed, 8*d*. Drawing.]

A.D. 1862, February 13.—N° 377.

PETERS, John.—(*Provisional protection only*.)—This invention relates particularly to portable agricultural steam engines, and may be applied to other smaller kinds of locomotive, stationary, and marine engines. It consist in placing the engine cylinder, which is of the oscillating class, within the steam dome of the boiler; the trunnion bearings are fixed on the top of the boiler; the steam admission and outlet exhaust passages pass respectively through the trunnions in the ordinary way, a valve being provided for reversing the engine when required. Inside the boiler the piston rod is coupled to a crank arm fixed on the end of the shaft, which passes out through a stuffing box attached to the side of the dome and made long enough to support the shaft without further assistance, or the end may be supported in a bearing resting on a bracket attached to the boiler side or otherwise. Motion is transmitted by means of a strap from a pulley fixed on the crank shaft, whereon is also an excentric for working the feed water pump, which is mounted on one side of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 13.—N° 384.

DAVISON, Thomas.—This invention for preventing the corroding of steam boilers in which the same water is repeatedly used, consists in introducing into the boiler "a salt or salts, such as "carbonate of soda, potash, or lime, capable of neutralizing the "corrosive action of the injurious agent present in the water." "The proportion of the salt required in any case will depend "upon the quality of the water used in the boilers, upon the "intervals at which it is convenient to renew the water, upon the "management of the boiler and engines, and upon the quantity "and kind of oil, grease, or other lubricant used in those internal "parts of the engine exposed to the steam, and from which it is "carried into the boiler by the steam and feed water. In general "there may be added to each gallon of water from about ten "ounces of a carbonate salt, down to a quantity barely sufficient "to render the water alkaline and equivalent proportions in the "case of other salts. For ordinary cases carbonates of soda or "potash may be used, or soda, potash, or lime in a caustic state; "but special impurities may require the use of phosphates or "nitrates of soda, or potash."

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 13.—N° 390.

ALLEN, Edward Ellis, and STEWART, John.—This invention relates to the construction of steam engine cylinders; these cylinders are divided, and contain two pistons which act simultaneously in the same direction; the pistons are united by means of a cylindrical trunk, which works externally against an annular central partition cast within the main cylinder, and internally against a circular plate or fixed piston, to which the inside of the trunk acts as a moving cylinder; this piston is held longitudinally in its place by a central bolt, which passes through a stuffing box in each main piston and is secured by nuts to the cylinder ends; the moving or main pistons give off power by means of two piston rods, which pass through stuffing boxes at one end of the cylinder to a cross-head, to which the main connecting rod is jointed; the inner edge of the central annular partition, through which the trunk works, is packed with metallic or wood rings, and the periphery of the fixed piston which is inside the trunk is also packed in the same manner; the packings of the main moving pistons

are of the ordinary description, and the slide valves are the same as those in common use. The steam is cut off in the annular spaces formed by the moving trunk alternately at each end of the cylinder, acting by turns between the annular partition and the inside face of the corresponding piston, whence it passes respectively to the cylinder ends and there acts alternately in an expanded state over the whole area of the piston faces; steam is admitted inside the trunk at the same time, which acts alternately against the central area of the inside face of each piston, and the corresponding sides of the fixed piston.

[Printed, 10*d*. Drawing.]

A.D. 1862, February 13.—N° 391.

McCONNELL, James Edward.—(*Provisional protection only.*) —This invention relates to parts of boilers and furnaces of locomotive and other engines.

1. An improved form of fire-bar applicable to engine boilers; the upper surface of such bars is made longitudinally convex instead of straight, so as to strengthen the bar towards the middle, where it is most fiercely acted upon by the fire. These bars may be cast singly or in sets of two or more, or they may be made of wrought iron and rolled to the required form by suitably grooved rollers.

2. Consists in lining boiler tubes with zinc, spelter, or other hard metal, either by coating the inner surface with such metal in a state of fusion during the manufacturing process, or by introducing in each a lining tube of zinc or such other metal, as will prove more durable than the metal of which the tubes are composed.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 15.—N° 406.

LAW, George Henry.—(*Provisional protection only.*) —This invention relating to steam boilers "consists in constructing the " bottoms and those portions of steam and other boilers, which " are the heating surfaces thereof, as far as practicable in the " form or manner of pyramids or halves, quarters, thirds, or other " definite portion of pyramids, or as triangular or approximatively " triangular troughs, or as cones, conoids, or the approximations

" thereof, or in manner of the forms and figures the reverse of " these, or in honeycomb form."

[Printed, 4d. No Drawings.]

A.D. 1862, February 19.—N° 438.

NASMYTH, JAMES.—This invention relates to "apparatus for " obtaining a circular motive power" or rotary engine, and "con- " sists in placing in the centre of a stationary cylinder a socket, in " which turns a rod or shaft passing through the cover of the " cylinder. At a suitable distance from the centre of the cylin- " der I place in it a moveable solid circular substance, or a move- " able tube with an arm or arms fixed in the shaft, which shaft " passes through the cover of the cylinder. The moveable solid " circular substance, or the moveable tube with its arm or arms, " circulates steam-tight between the top and bottom of the " cylinder. In the space between the cylinder and the said " moveable solid substance, or the said moveable tube, I place " a plate of any appropriate material, which plate I call a " piston, and fix it to the said solid circular substance, or the " said moveable tube. I then introduce steam or any elastic or " non-elastic substance on the surface of the plate or so-called " piston, by which the said moveable solid circular substance, or " a moveable tube, with its arm or arms moves insides the cylin- " der through a door attached by hinges, or other means to the " cylinder, which dôor is opened by the piston as it passes, and is " shut, and kept shut by a spring fixed in a recess of the cylin- " der, or by the pressure of steam."

[Printed, 6d. Drawing.]

A.D. 1862, February 19.—N° 441.

SYMONS, NATHANIEL.—This invention relates to a mode of increasing the effective power of steam pistons and cylinders. It consists in forming upon both faces of the piston and on the inside of bcth ends of the cylinder a series of parallel indentations, grooves, or corrugations, which extend respectively over their whole area. " This mode of increasing the surface and motive " power of pistons" "will increase the superficial area without " increasing the diameter of cylinders."

[Printed, 1s. Drawings.]

A.D. 1862, February 19.—N° 447.

BOUSFIELD, George Tomlinson.—(*A communication from John Welton Wilcox.*)—This invention, relating to a mode of preventing galvanic action in iron steam boilers and vessels, consists (1), "in interrupting the galvanic action, which is "produced in iron boilers, tanks, vats, &c. by their connection "with pipes, pumps, condensers, faucets, or other fixtures of "brass, copper, or other metals electro-negative to iron, by the "use of insulating joints by which the two metals are separated "by a packing of india-rubber or other non-conducting sub-"stance."

2. "In arresting and depositing from the water before it is "admitted to the boiler, tank, or vat, the copper or other metallic "salts held in solution by it, and which it has taken up in its "contact with the copper or brass fixtures through which it has "passed, by first passing the water through a vessel containing "zinc in small pieces or its equivalent in galvanic properties on "which the copper or other metal negative to iron will be de-"posited, and not be carried into the boiler or tank to produce "there a galvanic action so destructive to the iron vessel.

"By the employment of the insulating joints, as above "described, the surface condenser will be protected from the "thermo-electric current which was the principle source of its "deterioration when in connection with the iron boiler or the "cylinder; and this in connection with the filtration or puri-"fying of the water from the metallic salts held by it will "prevent the galvanic action in the iron boiler or tank, which "has heretofore been so destructive to it; and to cut off the "galvanic current the insulated joints should be introduced "between the iron boiler and all pipes or other fixtures which "are made of copper or brass."

[Printed, 8*d.* Drawing.]

A.D. 1862, February 22.—N° 478.

CAMP, James Peterkin Douglas.—(*A communication from Henry Steele.*)—This invention relates to slide valves, more particularly applicable to engines in use for purposes requiring only reciprocating motion. It consists in operating a secondary valve for admitting steam to act upon pistons to complete the movement of the main valve after it has been partly accomplished

by the main piston rod. The engine cylinder is provided with an ordinary valve chest fitted with two short cylinders, one at each end, open only to the valve chest, excepting that the outer end of one is fitted with a stuffing box for the passage of the valve rod. The face of the main valve is of the kind known as the short three-port valve. The seat of the secondary valve is either on the same plane or parallel to it; it is of the same kind but smaller than the main valve, with small ports required only for the passage of a small quantity of steam; these ports communicate respectively by separate passages with the outer end of the valve chest cylinders, which exhaust into the main exhaust pipe. The valve rod carries two pistons, one for each small cylinder, with faces open to the valve chest. The secondary valve is operated by a pin fixed to the valve rod, which acts between lugs at the back of the valve. The main valve is so connected with the valve rod by a long slot and a short tennon as to allow the rod to commence moving in each direction before the valve stirs, so that the secondary valve always takes the lead. The valve rod is connected by a connecting rod with a short crank, which is loose on a fixed stud secured to a projecting arm bolted to the cylinder. The crank effects the first movement of the valves in either direction, and also serves to limit their action; also loose upon the stud is the boss of a lever on which a fork is formed embracing the crank, but is so much wider as to permit the crank to make a quarter of a revolution within it. The lever is fitted with a sleeve, which is pivoted by a pin to an arm fixed on and projecting laterally from the piston rod, whereby the requisite motion is communicated to the valves.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 22.—N° 483.

JOHNSON, William Beckett.—This invention relates particularly to horizontal engines; it is also applicable to other kinds and consists in placing the air pump barrel at such an angle to the axis of the cylinder, that its connecting rod may be coupled to and worked direct from the end of the piston rod cross-head or joint pin. The steam cylinder is placed upon a cast metal box foundation, one part of which constitutes the condenser, wherein is the injection pipe, and the other part serves for the hot well; air pump barrel is bolted to the side; it is worked by a solid

[illegible] exhaust [illegible] denser [illegible] which [illegible] chimney [illegible] heated water [illegible] the boiler.

[Printed, 4d. No Drawings.]

A.D. 1862, February [illegible]

BENNETT, James [illegible].—This invention relates to [illegible] engines worked by air, or air and steam combined [illegible] a small steam boiler with a furnace [illegible] shell without a furnace [illegible] junction pipe leading out of the [illegible] an air conducting pipe [illegible] closed vessel, where [illegible] thence it passes out through [illegible] the small boiler, thereby forming [illegible] from the force pump into the small steam boiler where the air and steam commingle and then pass [illegible] closed vessel where [illegible] coiled pipe which [illegible] through.

With regard to [illegible] cylinders provided with slide or other valves are employed [illegible] vacuum is formed on one side of the piston or pistons, which [illegible] actuated by heated air alone or combined with steam; the crank shaft of the engine works the pumps which form the vacuum, [illegible] supply air through the coil of pipes in the closed vessel. Heated air is also employed singly or combined with steam in connexion with a vacuum for working rotary engines.

[Printed, 4d. No Drawings.]

A.D. 1862, February 27.—N° [illegible]

ADAMS, Thomas.—This invention relates to arrangements [illegible] effecting an equilibrium of steam pressure upon slide valve[illegible] steam and other engines, and consists in causing the steam [illegible] fluid to act on opposite sides of the valve at the same time [illegible]

"which rod is also movable with the first portion thereof by "means of the screw before-mentioned fixed to the end of the "rod. The dimensions of the annular injection orifice above-"mentioned are varied, for the purpose of imparting a speed to "the fluids injected in relation to the pressure of the generator. "On leaving the second tube or converging cone, the steam, con-"densed steam, and feed water being injected, traverses the "vacuum chamber, and thence is introduced directly into the "boiler by means of a small thin diverging cone. The dimen-"sions of the injection orifices of this latter cone may be varied "and regulated by means of a core formed on a prolongation of "the same rod, which has already passed through the two other "converging cones. Between the second and third cones, the "vacuum chamber exists; from this third cone the fluid traverses "a cylindrical pipe conducting it to the boiler, which cylindrical "conduct pipe is furnished with a valve for preventing any return "of water."

[Printed, 8*d*. Drawings.]

A.D. 1862, February 25.—N° 503.

PIDDINGTON, John. — (*A communication from William Winter.*)—(*Provisional protection only.*)—This invention relates primarily to apparatus for condensing the exhaust steam from high pressure and locomotive engines, and incidentally to preventing incrustation in the boiler, economizing water, heating feed water, increasing the effective power of high pressure engines, and economizing fuel. The apparatus is described as applied to a locomotive engine; it consists of a closed circular copper condensing vessel with hemispherical top, placed within the smoke box; two pipes for the passage of exhaust steam from the cylinders are attached to and open into this condenser, which by a flanged connection at bottom is united to another copper chamber or vessel, into which three pipes open, one for conveying cold water to the condenser through perforations in the upper part of the valve box, and the other two for the passage of heated water therefrom, through the action of the feed pump, to the boiler. A valve box is interposed between the two vessels, the valve in which opens downwards, and is operated by a float in the lower chamber. The valve and float being down, the cold water rises through perforations in the valve box into the condenser; the float rises and

closes the valve when the water has risen to the level of the exhaust steam pipe, through which the steam blows into the condenser alternately each return stroke of the pistons. That portion which escapes condensation passes by a bent up pipe into the chimney flue; a constant admission of cold and an emission of heated water is passing through the apparatus from the tender to the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 26.—N° 522.

BENNETT, James Henry.—(*Provisional protection only.*)—This invention relating to steam generators and engines worked by air, or air and steam combined, consists in the employment of a small steam boiler with a furnace, and a closed vessel or boiler shell without a furnace; the two communicate by means of a junction pipe leading out of the small boiler above the water line; an air conduction pipe connected to a force pump passes into the closed vessel, where it is disposed in curves, bends, or coils; thence it passes out through the shell, and is fixed to the top of the small boiler, thereby forming a continuous passage extending from the force pump into the small steam boiler, where the air and steam commingle and then pass off by the junction pipe into the closed vessel, where the hot mixed vapours impinge upon the coiled pipe, which by conduction heats the air on its passage through.

With regard to vapour or combined vapour engines, one or more cylinders provided with slide or other valves are employed; a vacuum is formed on one side of the piston or pistons, which are actuated by heated air alone or combined with steam; the crank-shaft of the engine works the pumps which form the vacuum, and supply air through the coil of pipes in the closed vessel. Heated air is also employed singly or combined with steam in connection with a vacuum for working rotary engines.

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 27.—N° 533.

ADAMS, Thomas.—This invention relates to arrangements for effecting an equilibrium of steam pressure upon slide valves of steam and other engines, and consists in causing the steam or fluid to act on opposite sides of the valve at the same time with

equal pressure. The valve is formed out of a plate, having a large portion of the central area cut away so as to leave an open frame, the ends of which are much broader than the sides; the top and bottom faces are parallel; it slides between the cylinder port facing and the cover of the valve box, which is furnished with metallic packing plates or strips; these packings bed upon india-rubber, and are thereby kept in steam-tight frictional contact with the back of the valve; recesses or false ports are sunk into the valve box cover opposite the induction ports on the valve seating; steam is admitted to these false ports to press on the back of the valve, and balance the pressure of the steam in the ports. The lateral steam pressure on the two ends of the valve is balanced one end by the other, and the pressure in the cylinder ports is balanced by the steam in the false ports, the steam being free to pass from the former to the latter through a small morticed opening through each end of the slide valve plate. The inside surface of the steam box cover is open to the exhaust steam, which also presses laterally with equal weight on the opposite inner sides and ends of the valve frame.

A modification of the above is described in respect to the disposition of the metallic packing strips and india-rubber beds, which are described as fitted to the back of the slide valve, instead of the valve box cover.

[Printed, 10*d*. Drawing.]

A.D. 1862, February 27.—N° 535. (* *)

GILBEE, WILLIAM ARMAND.—(*A communication from De Vos Verraert.*) — (*Provisional protection only.*) — Improvements in furnaces, consisting in forming the fire-bars with "conical, " tubular, or other shaped recesses or grooves formed in them " and arranged in a line with each other in the length and " breadth of the furnace, and permitting the circulation of air " received from without by suitable openings in the front and " around the grate." The bars are placed across the furnace. " The recesses of the bars begin at the entrance of the furnace, " the framework and plate of which are perforated with holes."

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 27.—N° 542. (* *)

WOOD, WILLIAM STUART. — "Improvements in valves for " regulating the flow of steam, water, or other fluids, and in

" means or apparatus for working or actuating them direct fron
" the governor, or when worked by expansion cams in connectio
" therewith."

" This invention consists of a duplex disc valve . . with suitabl
" openings or perforations therein, mounted upon a spindle pas
" sing through a stuffing box in a box or casing suitably forme
" with inlet and outlet ports, and arrangements for connectin
" same to or between the conducting pipes. This duplex dis
" valve is placed between two disc seats . . (having suitable o
" corresponding openings therein), one or both of which are capabl
" of adjustment. . . Steam, water, or other fluids may be admite
" either between the two discs or faces of the valve, and pas
" through the openings thereof and of the seats, when such
" openings are placed opposite to each other, or such fluids may
" be admitted and pass through the openings of the seats, and
" thence through the openings of the valve. The valve is cause
" to turn upon its axis by means of a lever fixed on the spindle
" thereof, and actuated by the governor. . . In order to give a
" very quick motion or movement of the valve an expansion
" coupling is placed betwixt the valve and the governor, consist-
" ing of right and left hand screws of quick pitch, the coupling
" or screw boss having a lever thereon, which by rod is connected
" to and actuated by the governor. I also employ such expan-
" sion coupling . . for traversing cut-off cams to operate valves
" as aforesaid, or otherwise expansion valves."

[Printed, 10*d*. Drawing.]

A.D. 1862, February 28.—N° 546.

MAKINSON, ALEXANDER WOODLANDS, and BATHO, WILLIAM FOTHERGILL.—This invention relates to the so constructing locomotive engines with one cylinder, that their oscillating motion while running, and the friction and resistance to onward motion, shall be reduced, and the number of working parts lessened and simplified. The cylinder is centrally disposed underneath, or within the bottom of the boiler smoke box, so as to work on the longitudinal centre line of the engine and actuate the single throw crank axle of the driving wheels; two links connected to two transverse levers are attached to the elongated ends of the cross-head; these levers are connected to two counter weights, which slide in brackets fixed to the side framing; they

are disposed one on each side of the engine and "are in weight " about equal to the weight of the piston, piston rod, and attach- " ments, cross-head, and half the connecting rod, and have a " reciprocating motion equal to but in opposite directions to the " piston. Their vis inertia throws upon the inside framing," and consequently upon the driving axles, pressures " which counteract " the pressures thrown upon it by the vis inertia of the piston, " piston rod, cross-head and half the connecting rod, &c. The " crank and other half of the connecting rod may be balanced in " the usual way by the revolving weights. When the engine stops on the dead centres, motion is given to it by means of a pair of friction discs, which are made to embrace and act against the bevelled sides of one of the driving wheel tires; one of these discs is worm toothed round its edge, to be acted upon by a worm at one end of a rod and a handle upon the other within the reach of the engine driver, who also, by means of another rod and handle, throws the discs in and out of contact.

[Printed, 10*d*. Drawing.]

A.D. 1862, March 1.—N° 570.

DAVIS, John Whitmore, and DAVIS, Francis.—This invention relates to supplying feed water to steam boilers without the aid of force pumps. Superposed on the boiler there is a vertical valve box closed by a flanged cap; the valve is tubular, and externally of two diameters, which incline to each other at a suitable angle for resting upon the annular seating within the valve box; steam is admitted up the centre of the valve into the cap, where by pressing upon the top of the valve it keeps it on its seat; the forked end of a lever within the boiler embraces the valve spindle, some liberty of action being allowed before the valve moves; a float is attached to the longest end of the lever, which is curved downwards for that purpose. A steam pipe forms a communication between the valve box and a closed water supplying vessel placed above the water level; a feed pipe attached thereto leads downwards to the bottom of the boiler; a back pressure valve is interposed between the flange of this pipe and its attachment to the bottom of the vessel. The supply pipe in connection with the main reservoir opens to the vessel at the top, through a valve which is closed by the ascent of a float suspended thereto by a short rod. When the float sinks below the working level in

consequence of lowness of water in the boiler, the tubular valve is raised by the short end of the lever, which allows an escape of steam through the steam pipe into the water supply vessel, which has been filled with water by the previous operation of the apparatus. So soon as the accumulating pressure of steam above the water in the vessel is in equilibrio with the steam in the boiler, the water assisted by its own gravity opens the valve and flows down the feed pipe into the boiler; the rising float then shuts the tubular valve which closes the steam pipe. So soon as the steam condenses in the vessel, which takes place during the time allowed for the lever end to move before it again lifts the tubular valve, a vacuum is formed in the closed vessel, which draws fresh water from the reservoir up through the supply pipe, filling the vessel until the small float rises and closes the valve at the entrance, in which state it remains, until, by the sinking of the water in the boiler, the tubular valve is again opened, and the operation repeated.

[Printed, 10*d*. Drawing.]

A.D. 1862, March 8.—N° 619.

WILLIAMSON, Alexander William.—This invention relates to the construction of apparatus for generating and superheating steam; it consists in ranging a close series of pressure bearing metal tubes along each side of the furnace; these tubes are parallel with each other; their lower ends are connected to and are supported by longitudinal pipes placed along outside the firebrick sides of the furnace; the tubes lean over the furnace, each side series inclining to the other, so as to leave a narrow top space between them. A longitudinal pipe disposed on each side above the apparatus communicates respectively with the tubes in each series by means of small thin metal bent tubes, which yield to the lengthwise expansion and contraction of the tubes. Outside each series of pipes another series is disposed, also communicating top and bottom with longitudinal pipes in the same manner; then another series is added on each side, and another, so that there are four separate series of pipes on each side, with a corresponding number of top and bottom longitudinal pipes; all the latter on each side unite and communicate with the water supply, and all the top longitudinal pipes form a union and communicate jointly with the steam chamber. The apparatus is fired at each end; each

furnace is divided by a fire-brick partition, from which arches spring over the fires, and rest respectively against the inner series of tubes; by these means the flaming gases are directed from each fire respectively right and left amongst the tubes, meeting again above the arches on the way to the uptake. The water level is established in all the water tubes some distance from the top ends, which being exposed to the hot draughts act as superheaters. The small bent tubes are protected by a plate.

[Printed, 10*d*. Drawing.]

A.D. 1862, March 8.—N° 622.

BLAIR, Andrew.—This invention relates to rotary engines; which consist of a fixed steam cylinder concentrically through which, resting in stuffing boxes fitted on each end cover, passes the main shaft; on this shaft a drum of such small diameter is fixed within the cylinder, that an annular space is left between them for the operations of the steam; the ends of the drum are flanged, and fitted to work as closely as possible to the cylinder covers without appreciable friction, by preference no packing being used; the annular space is divided longitudinally by a partition or piston, which extends from end to end between the flanges on the drum; in form it rises in tangent lines from the surface of the drum to a narrow edge, which revolves in light frictional contact against the cylinder sides; this partition acts the part of a piston and is driven round by the steam, resistance being provided by a radial-acting abutment slide, which works in a morticed passage through stuffed surfaces; this slide is forced out each revolution by the tangent incline on the front side of the advancing piston; the back of the abutment slide enters the steam chamber, and as soon as the piston has passed the end of the slide, the latter is made to slide inwardly by the pressure of the steam, and in so doing opens at the extreme end of its action the steam induction port, the supply of steam being timed and regulated by a valve. The momentum of a fly-wheel is made available for regulating speed, and for passing the exhaust passage, which in relation to the induction port is on the opposite side of the slide. "The details are susceptible of various modifications, "thus the channel in the drum may be either rectangular or of a "*curved or other* convenient form. Two or more cylinders may "*be applied* adjacently on the same shaft, with the wings or

" pistons of each placed at different points, or there may be in " one cylinder two or more entrances and outlets for the steam " and two or more wings or pistons."

[Printed, 10*d*. Drawing.]

A.D. 1862, March 10.—N° 641.

PARKER, William, and BATMAN, George Henry.—This invention, relating to steam engines, consists in furnishing engine cylinders with two pistons, each piston with single action reciprocating motion to the other; these pistons are held together by an intermediate plate, wherein at the centre is formed a vertical slot or opening. The crank shaft enters the cylinder side through a stuffing box fixed at its mid-length; the crank arm revolves within the cylinder; the crank pin carries a "trunion" or slide, which works up and down in the slotted opening in the intermediate plate, whereby the lineal movement of the pistons is converted into the rotary motion of the crank. The slide valve is actuated by a sector, to which two antifriction rollers are fitted which act against a projection at the back of the slide. The "cylinders may be fixed " and fitted in the ordinary manner, and employed either in a " vertical or horizontal position, and the central openings cast or " otherwise formed therein, the said shaft being supported upon " bearings formed therein or otherwise attached thereto, and we " would note that separate steam chests may be employed in " place of the one as represented, by which means the steam " ports may be much shortened and a considerable saving of " steam thereby effected."

[Printed, 8*d*. Drawing.]

A.D. 1862, March 10.—N° 646.

BARCLAY, Andrew. — This invention relating to traction engines and steam pressure indicators consists, (1), in mounting an ordinary tubular locomotive boiler between a rectangular framing, supported in front by suitable bracket bearings upon the driving wheel axle, which is placed towards the fore end of the engine; the after end is supported by one central trailing wheel under the foot plate; the driving wheels run loose on the axle, they are of large diameter and are driven separately by a distinct pair of

engines, the cylinders of which are disposed between the driving wheels and the side frames, upon brackets bolted thereto; an upright bracket on each side, attached to the frame over each driving axle bearing, carries two crank shafts, on each of which respectively at opposite ends there is a pinion on each shaft, which gears into internal gearing fixed round inside the rim of the corresponding driving wheel. The cylinders are set at a suitable angle to actuate these crank shafts, which by means of their respective pinions rotate the wheels. The steering is effected by the driving wheels being actuated differentially through the steam regulator, which by a simple side motion of a handle in the direction corresponding with the desired turn of the engine, will partially or entirely shut off the steam from the cylinders on the side to which the handle inclines, and admit a larger quantity to the other pair; in this way the engine driver, while looking ahead, is enabled to turn the engine in either direction without the assistance of any other guiding apparatus. The ordinary excentric gear in connection with the link motion is applied for the purpose of reversing. It is preferred to fit projecting wooden plugs into recesses round the peripheries of the driving wheels. A modification of the engine is shown on two driving wheels only, rigidly attached to the framing of a passenger carriage, also with two wheels; a vertical boiler is used and superheating pipes are introduced into the uptake.

2. Relates to a pressure gauge, the chamber of which is in two flanged halves which are bolted together; the chamber is separated by a vulcanized india-rubber diaphragm, which together with a thin steel plate, is secured between the flanges; the steel plate is pierced in the centre to receive a round nib formed on the end of a vertical spindle, which by means of a lever and rack within the dial case, actuates a small pinion on the central pin, whereby, according to the degree of pressure, the pointing finger is moved round the graduated scale on the face of the dial. The steel plate is equally divided by a number of saw cuts radiating from the centre, so that each sectorial division forms a separate spring resistant; two steel plates are sometimes used. There is no steam admitted above the diaphragm, consequently no injury can result to the steel plate or plates.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1862, March 11.—N° 655.

HUMPHRYS, Edward.—(*Provisional protection only.*)—This invention relates to that description of compound steam engine "in "which two cylinders, a small one, into which the steam first enters, "and a larger one in which it is subsequently allowed to expand, "are employed, and in which the pistons of the cylinders are "connected together by a piston rod passing through the cover "or partition which separates the small from the large cylinder.

"The improvements consist in applying a trunk to the large "piston and a suitable connecting rod, as in ordinary trunk "engines, to transmit the power from the two pistons to a crank "on a shaft or axis."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 12.—N° 666.

FAWCETT, John.—(*Provisional protection only.*)—This invention, relating to cranks and crank axles for locomotive and other engines, consists in making such cranks tubular throughout their whole length, instead of making them in accordance with the usual mode of construction, of solid metal. A number of bars of fibrous iron are welded together into the form of a tube, and afterwards bent or cranked to the required shape, hollow from end to end, or a crank shaft may be made solid at each end and hollow at the cranks or throws. It is also proposed to make tubular cranks by casting them of steel or other metal, and introducing into the mould a central sand core, so that when cast they may be hollow.

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 12.—N° 670.

JOHNSON, John, and MORRIS, Samuel.—This invention relating to steam boilers, consists in making the bridge a hollow chamber, and sending the principal portions of the flaming products of combustion through a group of horizontal tubes contained therein; this bridge chamber is supported by pipes, which form water communications with the top and bottom of the flue. Also in the flue, diametrically fixed to opposite sides, is a series of hollow tubular vessels placed at regular intervals in succession at different angles across the flue; the ends of these

chambers are reduced to the size of a small pipe, whereby with a nut on each side of the flue plate, they are secured in their position in the flue, and so form diametral water communications. In some cases, instead of the tubular vessels, an annular chamber is concentrically placed in the flue, and supported therein top and bottom by short pipes which communicate with the water space; the annular chamber may or may not contain a circle of horizontal tubes. A double cylinder is disposed at the back part of the flue for the purpose of heating the feed water. The parts are made of welded wrought iron.

[Printed, 10*d.* Drawing.]

A.D. 1862, March 13.—N° 682.

VIDIE, Lucien.—This invention relates to improved arrangements of mechanism in aneroid barometers which are partly applicable in the construction of steam gauges. It consists, (1.) In taking the movement for working the hand off a point in the spring which works horizontally, for which purpose the spring is made to assume a greater curve, and is formed with one or more parts nearly or entirely vertical. 2. Applying an external spring of secondary force on a vacuum box supported by springs against atmospheric pressure; this external spring and box are employed to work the mechanism, whereby the hand is fixed at the point and the counter weight is supported; the extremity of the spring may be made to abut against the vacuum box. 3. Converting the vertical into a horizontal movement of the vacuum box by the use of two rods abutting at right angles against a lever which is diagonally disposed. 4. Applying to the rotative motion of the axis which moves the hand, two pins resting in conical orifices, or one resting in a hole and the other in a groove, and surrounding " the axis with a strap to prevent it escaping from the effect of a " shock." 5. Giving rotative motion to the axis of the dial hand by means of a wire, which after it is twisted once or twice round the axis, has its ends respectively fastened to the ends of a bow, to which at one end advancing motion is given by the mechanism, and the reaction is caused by a spring. 6. Attaching the end of the wire or the bow by a hook or buckle acting by means of a pointed piece, instead of having it pinned. 7. Forming a helical spring of metallic wire and bending the two ends towards the axis, and then turning them outwards at right angles on the axial

line; one is made fast, and the dial hand is mounted on the other. 8. When an endless screw is used for turning the axis of the hand, regulating its course by inclining more or less the action of a lever employed to turn the screw in rising. 9. Employing a counterweight with its centre of gravity eccentric with the centre of its bulk. 10. Placing the counterweight inside the vacuum box at the end of the lower blade of a spring. 11. Attaching an arm advancing horizontally inside or outside with a counterweight at its extremity, to the central part of the upper diaphragm of the vacuum box. 12. Instead of the usual sole plate, fixing the apparatus upon a metallic box made with a conical bottom, so that the vacuum box can be strongly attached to it. The parts 3, 4, 5, 6, 7, and 8 are applicable to steam gauges.

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 13.—N° 690.

BONNETERRE, Séverin Virgile, ERHART, Charles Théodore, and MONTI, Jules Ferdinand.—This invention relates to "apparatus for regulating the pressure of steam in steam "boilers, and the combustion in their furnaces."—The object of the invention is to regulate the pressure of steam by the combustion in the furnace, and vice versa, so that they shall reciprocally regulate each other. For this purpose a vessel with flexible sides in communication with the boiler is employed; when the pressure of steam in the boiler increases, it causes the vessel to expand, and when the boiler pressure diminishes, the vessel contracts; these contrary effects are made to operate on valves, dampers, or other suitable contrivances, whereby the supply of air to the fire or draught area in the flues is correspondingly increased or diminished. When applied to blast and other furnaces supported by forced draughts mechanically supplied with air, the draught valve may be placed in the air passage; and when applied to ordinary furnaces where the draught is produced by connection with a chimney, the valve may be placed in the chimney flue.

[Printed, 8*d*. Drawing.]

A.D. 1862, March 13.—N° 691.

HENRY, Michael.—(*A communication from Francisque Million.*) —This invention relates to packings and stuffing boxes, chiefly

applicable to shafts or tubes in motion; it is supplementary to a former invention described in the Specification thereof, dated November 22, 1861, N° 2940. Several modifications of the present invention are shown and described, all more or less differing in detail. The first consists of a tube free to slide longitudinally on a rod or pipe; one end of this tube is screwed with a fine thread on the outside, to receive a short tubular ring which is threaded internally at each end; this ring encloses and forms the annular recess for the packing and gland, and when screwed on the tube down to its place, it is held there by set screws; the gland is threaded outside to correspond with the ring tube commencing a short distance from the end; it slides a short distance into the ring tube, and is then tightened up against the packing, which is of the ordinary description, by means of the screw. When necessary, to suit shafts with collars or projections, all the parts described can be made in halves, which are secured together by external rings slightly inclining inside, to fit on to corresponding inclines on the parts composing the stuffing box.

Stationary stuffing boxes are constructed with modifications.

[Printed, 8*d*. Drawing.]

A.D. 1862, March 13.—N° 692.

BROOMER, Richard Archibald.—(*A communication from Jean Claude Garnier.*)—This invention, relating to apparatus for measuring and regulating the flow of gas, is also in part applicable to hydraulic receivers and steam generators. The details of the apparatus are contained in a case, and consist of an arrangement for maintaining a constant level of the water in the meter, shut off and bell-ringing mechanism, the details for regulating and indicating the quantity of the passing gas, arrangements for producing an equilibrium of pressure, and two manometers (the workings of which are indicated by small needles on their respective dials) are fitted to control the pressure of the inflowing and outflowing gas, a perfect equilibrium of circulation and of pressure being established within the apparatus, which as constructed "is calculated, "1st, to regulate, indicate, and control the quantity of gas passing "through it; 2nd, to indicate the pressure of the gas entering "and of that leaving it; 3rd, to cause a uniform light from every "burner in any one establishment, whatever the number of such "burners; 4th, to compensate for any neglect by its hermetic

"closing and by the ringing of a bell, which takes place on the "extinction of the last burner at whatever distance it may be from "the apparatus; and 5th, to prevent any explosion or loss of gas "by instantaneously indicating all escape, however small the "quantity may be."

[Printed, 1s. 2d. Drawings.]

A.D. 1862, March 17.—N° 734.

WEEMS, John, and WEEMS, William.—This invention relates to "indicating and regulating the pressure and discharge of "fluids." Applied as a steam-pressure gauge, it "consists of a "diaphragm of india-rubber, metal, or other suitable material "fitted in a small steam chamber. To this diaphragm is attached "a rod, the upper part of which forms a rack that gives motion "to a wheel; depending from this wheel is a lever or rod with a "ball or weight attached to its extremity. The spindle of the "wheel projects through the dial or index face, which is graduated to show the pressure in lbs., and to this spindle the pointer "or index is attached. When the pressure of the steam, air, gas, "or other fluid acts upon the diaphragm it raises the vertical "rack and moves round the wheel, to which is attached the lever "weight, and which serves to keep the index in a vertical position "when not otherwise acted upon. The pressure on the diaphragm "causes the lever weight to rise towards the centre, at the same "time giving motion to the pointer, and thus indicates the "pressure."

In a modified form this part of the invention is applied to adjust the position of dampers in furnaces.

The other part of the invention refers to modifications in apparatus for removing the water of condensation from steam cylinders in engines, hammers, and similar machines, while at the same time a uniform pressure is maintained on the piston.

[Printed, 10d. Drawings.]

A.D. 1862, March 19.—N° 769.

BROOMAN, Richard Archibald.—(*A communication from Serkis Ballian.*)—This invention, relating to rotary engines, consists of a movable plate piston, made to slide to and fro through a morticed shaft by double contact with the internal surface of an "ellipsoidal cylinder" supported on suitable framing

which carries the bearings of the shaft. The surface of the shaft revolves against a packing strip bedded in a groove along the surface of the cylinder. At each edge of the plate piston there is a metal packing, and also at the extremities, which work against the flanged covering plates enclosing the ends of the cylinder; eccentric to which, on the outside of each cover, there is a stuffing box for maintaining a steam-tight joint round the shaft. The steam inlet passage is on one side of the point of contact between the shaft and the cylinder, and the exhaust outlet passage is on the other side. A cup and tap are provided for introducing a lubricant into the cylinder; and when it is desired to reverse the action the inlet passage becomes the exhaust and the outlet the port of admission. The steam admission tap acts also as a regulator. The two ends of the piston plate are alternately acted upon by the steam each succeeding revolution of the shaft, caused by the eccentric position of the shaft in relation to the sides of the cylinder. The engine is to be worked either by steam, air, or other aeriform vapour.

[Printed, 10*d*. Drawing.]

A.D. 1862, March 21.—N° 786.

HART, John Matthias, and LAVENDER, Robert.—This invention relates to generating steam in a boiler of any form or construction. The steam is then conducted into superheating pipes or chambers suitably interposed between the boiler and the engine, so that the steam on its passage from one to the other shall be brought into contact with the heated surface of the iron or copper superheating pipes and surfaces. The metal composing the pipes, in a heated state absorbs oxygen from the steam, becomes oxidized, and is rapidly destroyed. In order to prevent this the superheating pipes or chambers are filled with granulated material, either earthy, metallic, or carbonaceous compounds, broken or moulded into such forms as will present the greatest amount of surface, so that it may the more effectually take up heat from the tubes or chambers and impart it to the steam; at the same time the material will absorb the oxygen. "It will "readily be seen that in addition to the advantages gained in "preventing the oxidation of the superheating pipes or chambers "*by filling them* with any of the materials named above we have "*an additional* advantage of an increased surface for the trans-

" mission of the caloric to the steam by means of the large area " of surface of each fragment of the material of which the super- " heating pipes or chambers are filled."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 21.—N° 788.

HUMPHRYS, James. — This invention relates to the slide valves, and to the combination and arrangement of parts of compound cylinder engines working conjointly high and low-pressure steam.

1. It consists of a novel description of valve applicable to compound engines, combining simplicity of construction with economy in effecting the transmission of steam from the high to the low-pressure cylinder. The valve is a treble-ported slide valve. The laps at the ends of the valve cut off and supply to the same cylinder the high-pressure steam from the boiler. The steam first operates the piston in the smallest cylinder, then passes through a passage forming part of the valve into the large cylinder, where it enters, acts expansively, and leaves for the condenser by the inner portion of the valve, which resembles an ordinary double-ported slide valve.

2. Consists in the disposition of the parts of compound engines. A horizontal arrangement of the cylinders is particularly adapted for driving screw propellers, but they may be either vertical or arranged at an angle. The small cylinder is concentrically placed within the large cylinder, so that the outer piston is annular; it has two piston rods, which are attached to opposite sides of the piston and work through two stuffing boxes in the cylinder cover on a line with the centre, whence the high-pressure piston rod springs; both high and low-pressure pistons have simultaneous action in the same direction. All the three piston rods are attached to one cross head which works in guides forming part of the main framing of the engine. The connecting rod, which is coupled to the crank pin at the outer end, has a wide fork at the inner end to joint on to the cross head. The excentrics and their rods for working the slides are placed upon the crank shaft outside the outer bearing. The cylinder covers and bottoms are cast hollow to form steam heating space, as is also the space formed between the cylinders.

[Printed, 8d. Drawing.]

which carries the bearings of the shaft. The surface of the shaft revolves against a packing strip bedded in a groove along the surface of the cylinder. At each edge of the plate piston there is a metal packing, and also at the extremities, which work against the flanged covering plates enclosing the ends of the cylinder; eccentric to which, on the outside of each cover, there is a stuffing box for maintaining a steam-tight joint round the shaft. The steam inlet passage is on one side of the point of contact between the shaft and the cylinder, and the exhaust outlet passage is on the other side. A cup and tap are provided for introducing a lubricant into the cylinder; and when it is desired to reverse the action the inlet passage becomes the exhaust and the outlet the port of admission. The steam admission tap acts also as a regulator. The two ends of the piston plate are alternately acted upon by the steam each succeeding revolution of the shaft, caused by the eccentric position of the shaft in relation to the sides of the cylinder. The engine is to be worked either by steam, air, or other aeriform vapour.

[Printed, 10*d*. Drawing.]

A.D. 1862, March 21.—N° 786.

HART, JOHN MATTHIAS, and LAVENDER, ROBERT.—This invention relates to generating steam in a boiler of any form or construction. The steam is then conducted into superheating pipes or chambers suitably interposed between the boiler and the engine, so that the steam on its passage from one to the other shall be brought into contact with the heated surface of the iron or copper superheating pipes and surfaces. The metal composing the pipes, in a heated state absorbs oxygen from the steam, becomes oxidized, and is rapidly destroyed. In order to prevent this the superheating pipes or chambers are filled with granulated material, either earthy, metallic, or carbonaceous compounds, broken or moulded into such forms as will present the greatest amount of surface, so that it may the more effectually take up heat from the tubes or chambers and impart it to the steam; at the same time the material will absorb the oxygen. "It will " readily be seen that in addition to the advantages gained in " preventing the oxidation of the superheating pipes or chambers " *by filling them* with any of the materials named above we have " *an additional* advantage of an increased surface for the trans-

" mission of the caloric to the steam by means of the large area " of surface of each fragment of the material of which the super- " heating pipes or chambers are filled."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 21.—N° 788.

HUMPHRYS, James. — This invention relates to the slide valves, and to the combination and arrangement of parts of compound cylinder engines working conjointly high and low-pressure steam.

1. It consists of a novel description of valve applicable to compound engines, combining simplicity of construction with economy in effecting the transmission of steam from the high to the low-pressure cylinder. The valve is a treble-ported slide valve. The laps at the ends of the valve cut off and supply to the same cylinder the high-pressure steam from the boiler. The steam first operates the piston in the smallest cylinder, then passes through a passage forming part of the valve into the large cylinder, where it enters, acts expansively, and leaves for the condenser by the inner portion of the valve, which resembles an ordinary double-ported slide valve.

2. Consists in the disposition of the parts of compound engines. A horizontal arrangement of the cylinders is particularly adapted for driving screw propellers, but they may be either vertical or arranged at an angle. The small cylinder is concentrically placed within the large cylinder, so that the outer piston is annular; it has two piston rods, which are attached to opposite sides of the piston and work through two stuffing boxes in the cylinder cover on a line with the centre, whence the high-pressure piston rod springs; both high and low-pressure pistons have simultaneous action in the same direction. All the three piston rods are attached to one cross head which works in guides forming part of the main framing of the engine. The connecting rod, which is coupled to the crank pin at the outer end, has a wide fork at the inner end to joint on to the cross head. The excentrics and their rods for working the slides are placed upon the crank shaft outside the outer bearing. The cylinder covers and bottoms are cast hollow to form steam heating space, as is also the space formed between *the cylinders*.

[Printed, 8d. Drawing.]

A.D. 1862, March 24.—N° 814.

TOPHAM, JOHN. — This invention relates to apparatus for cleansing steam boilers and preventing incrustations. It consists in placing inside near the bottom of the boiler, extending the whole length, one or more longitudinal pipes with closed ends, which communicate by means of a socket junction with a vertical pipe that passes out at the top of the boiler; the longitudinal pipes are perforated with holes at intervals along their under sides; the united area of these holes must not exceed the area of the outlet; along the centre of the boiler near to the water level an open metal trough is disposed upon the upper side of another longitudinal pipe, which reaches about half the length of the boiler; the trough communicates with the pipe by a series of small holes along its bottom; this pipe is united by an angular bend to another vertical pipe, which also opens through the top of the boiler near to the first-named vertical pipe; outside the boiler a double flanged cock is mounted on the top of each of these pipes, both of which communicate with the outlet pipe; these cocks are respectively opened when there is an accumulation of sediment deposited along the bottom of the boiler, or any quantity of scum or extraneous matter in the trough; the pressure in the boiler upon the water forces it into the longitudinal and up the vertical pipes, and with it the objectionable matter separated from the water by the process of boiling. In some cases where feed water is obtained from streams generally in a turbid state, the longitudinal pipes are furnished on each side with a series of lateral branches which are curved upwards to conform to the configuration of the boiler; these branches have a series of perforations along their under sides, through which the sedimentary deposit passes into the pipes.

[Printed, 1s. 10d. Drawings.]

A.D. 1862, March 26.—N° 831. (* *)

JOHNSON, JOHN HENRY. — (*A communication from Claude Dumas.*)—" Improvements in apparatus for cleaning tubes and " flues of steam boilers and similar conduits."

"The said invention consists in the application and use to and " in the manufacture of brushes intended for the cleaning of the " tubes and flues of steam boilers and similar conduits or passages *the rush* known in South America as 'piazava' or 'bastin,' *r as an* entire substitute for bristles or tufts of wire, or in

" combination with those substances. The tufts of rushes are
" fixed in any convenient manner into a stack of wood, or into
" branches or stems of wire, and are then trimmed to a cylindrical
" or other desirable form."

[Printed, 8*d*. Drawing.]

A.D. 1862, March 26.—N° 833.

PARKER, JAMES.—(*Partly a communication from Bernhard August Schäffer.*)—An invention relating to steam engines and apparatus connected therewith, consists, (1) in so regulating the discharge of steam from engine cylinders working expansively, that back pressure is reduced or avoided. Two valve chambers, communicating separately by suitable exhaust passages with each end respectively of the engine cylinder, are disposed alongside; each chamber contains a valve; these two valves are united by a rod; both valve chambers communicate at the back of their respective valves with the exhaust pipe. The valve seatings are composed of flat steel rings, which rest on annular india-rubber packings; the valves act alternately, the opening of one closes the other, and vice versa. The incoming fresh steam operates the valves; at the moment when it is admitted to one or other end of the cylinder the valve at that end is pressed tightly against its seat, and the valve at the opposite end is simultaneously pushed back, thereby affording instant relief to the spent steam in the corresponding end of the cylinder, the valve remaining open until the end of the stroke, when in its turn it is suddenly closed by fresh incoming steam and the other opens to exhaust. The ordinary steam chest and slide valve are disposed as usual on the cylinder and act independent of the auxiliary exhaust.

2. Consists of apparatus for discharging the water of condensation from steam pipes without loss of steam. An open float vessel is disposed within a closed chamber which receives the water of condensation from the steam pipe; an outlet tube passes downwards through the top of the chamber into the float vessel, which rises as water accumulates in the chamber and brings a valve face within it up against the lower end of, and thus closes, the tube; when the water has risen sufficiently high it runs into the float vessel, which thereby loses its buoyancy and sinks, leaving the outlet tube open; the steam pressure then acts upon the surface of the water within the float vessel, and drives it up the outlet tube and away.

3. Relates to apparatus for removing condensed steam water from engine cylinders; it is constructed to act on a similar principle to the auxiliary exhausting valves herein first described; it is nearly a miniature of that apparatus, the passages being mere tubules, and the chambers, valves, and outlets proportionately small.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, March 29.—N° 876.

TOWNSEND, Charles Henry, YOUNG, James, and HANKINS, James.—(*Letters Patent void for want of Final Specification.*)—This invention relates to a mode of removing and preventing incrustation in steam boilers, and consists in the use for that purpose of valonia, sumach, aud potash, mixed together in the following proportions:—Ground valonia 26 lbs., sumach 1 lb., potash 1 lb., to be put through the man-hole into the boiler when empty, at the rate of 2 lbs. of the composition to every three horse nominal power. The boiler should be washed out at the end of every month's work, and a fresh supply of the composition put in, which by continued use will remove and prevent all incrustation.

[Printed, 4*d.* No Drawings.]

A.D. 1862, March 31.—N° 902.

JOHNSON, John Henry.—(*A communication from Wilhelm Heinrich Christian Voss.*)—(*Provisional protection only.*)—This invention relates to a peculiar construction of rotary engine, "and "consists in the employment of a pair of disc wheels, having a "number of steam ports cast therein, each disc being fixed on a "separate shaft of its own. In place of the two shafts being in "the same axial line with each other they are placed at an angle, "so that one edge of the discs will be nearer together than the "opposite edge. The steam ports or passages pass through the "discs, and the corresponding ones in the inner faces of the two "discs are connected by expansible bags or tubes of vulcanized "india-rubber or other suitable material. A valve is so arranged "as to admit the steam into each port successively as the discs "revolve, the steam entering that port and bag or tube which is "situate at the point where the edges of the discs are nearest together. As the steam expands this tube it tends to rotate the

"discs, and bring the next succeeding port under the valve, "which then receives steam in its turn, and so on, the exhaust "taking place through the opposite disc, and at a point where "the expansion of the tube is no longer of service. Motion is "transmitted from these discs by having spur teeth cast thereon, "gearing into corresponding pinions on a second motion shaft. "The bearings which support the shafts of the two disc wheels "are made adjustable on their tables, so as to regulate exactly the "angles of the two shafts."

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 3.—N° 940.

BOWER, George, and QUALTER, John.—This invention, relating to metallic pistons, is supplementary to the Specification of a Patent bearing date May 1, 1860, No. 1098, which relates to the use of wedges and screws for the purpose of expanding packing rings. The present invention consists in the use of laminated springs, constructed with two, three, or more plates, similar to a light carriage spring; three of such springs are employed within a piston; they are fixed to blocks which slide in converging mortices within the body of the piston, so that the two ends of each spring bear divergently against the inner ring, which acts obliquely with obtuse inclines against the annular packings; the sliding blocks are pressed outwards (in one example) by excentrics formed upon screw bolts, which are let into the face of the piston, these act as revolving wedges against the sliding blocks; in another example the backs of the blocks are bevelled, and acted upon expandingly by wedges. The six free ends of the three enclosed laminated springs press on the ring at six equidistant points within its inner circle, so that their united expansive force is well distributed. Springs composed of a series of plates are employed in contradistinction to any single plate spring, the former being more evenly elastic and serviceable.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 3.—N° 947.

LEE, Joseph.—(*Provisional protection only.*)—This invention relates to traction engines and steam boilers, and with regard to engines consists "in giving motion to the main or driving "pair of wheels by a pinion on the crank shaft of the

" engine gearing into an intermediate wheel, on the axis of which " is another smaller wheel, which gears into a toothed wheel on " the axis of the main or driving wheels. The intermediate " wheels turn on a stud, which projects from the bracket which " carries the crank shaft; this stud, the crank shaft, and the axis " of the main wheels are so placed that their centres are all in " one vertical line."

With regard to boilers, it consists " in constructing them so " that the horizontal tubes which pass from the fire-box conduct " the products of combustion into a smokebox or chamber, from " the top of which they pass away through vertical tubes which " rise up through the dome or steam chamber of the boiler, and on " the exterior of the dome the tubes open into a chimney, which " can be turned down when the tubes require cleaning. The " smoke-box or chamber above mentioned is formed by the plate " which receives the ends of the horizontal tubes from the fire-" box being bent at right angles, the portion bent down at right " angles receiving the vertical tubes which rise up through the " dome."

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 4.—N° 952.

KAY, James Clarkson, and HARTLEY, William.—An invention relating to horizontal and other condensing steam engines, consists in the particular relative disposition of the air pump, condenser, and hot well, and in the suction and delivery valves connected therewith. The air pump is placed under the cylinder and over the suction valves, it is double acting, and is worked by a connecting rod attached to the steam piston cross-head; there are four suction valves at each end of the condenser, but more or less may be used. The delivery valves are placed in two sets of four each on one side of the air pump, they open into the hot well. The condenser is disposed on the other side of the air pump. The valve box, condenser, and hot well form the stand on which the cylinder end of the foundation frame rests. To each end and at the top of the air pump, valves are placed opening into the hot well for carrying off air and water; the injection branch, which is circular at the flange, varies its form to a narrow slot, for spreading the injection water into a sheet. Access can be had to each set of suction valves through the lids,

and to the delivery valves in the same manner. The air pump being double acting, with a stroke equal to the length of the stroke of the steam piston, is only required to be one-fourth the transverse sectional area necessary for beam engines of equal capacity; and in consequence of its small diameter, the area of the openings in the suction and delivery valve seatings can be made to correspond. A good vacuum is secured in the condenser by reason of its horizontal position, which gives more effective condensing surface. A modification is shown and described.

[Printed, 1s. 4d. Drawings.]

A.D. 1862, April 4.—N° 956.

SILVER, Thomas.—This invention relates to apparatus for governing the speed of steam and other engines. It consists of two parts or shafts disposed in a line end to end; one half part is rotated by the engine to be governed, and the other part by independent means possessing uniformity of speed; or if the latter be not rotated, then it must possess uniform power of resistance. On the end of each shaft there is a bevel wheel gearing into an intermediate bevel, which revolves loosely on a vibrating arm, and is employed for converting the difference in the motions of the two parts into a movement for regulating the action of the throttle valve or the means by which admission of power to the engine is effected. In cases where only one part of the apparatus is rotated, and that by the engine to be governed, the non-rotating part is either connected to a "spring steam "pressure disc" or other elastic medium of resistance, or a counter-weight may be employed, and the fly wheel may be furnished with vanes capable of adjustment and resistance, or centrifugal weight may be employed instead; the vibrating arms serve to work the throttle valve. Modifications are shown and described.

[Printed, 8d. Drawing.]

A.D. 1862, April 4.—N° 963.

FIELDING, Samuel, FIELDING, Samuel, the younger, FIELDING, Robert, and FIELDING, Thomas.—This invention relates to valves for steam engines and to lubricating apparatus. The valve box is a round case formed in two halves, which are bolted together by means of annular flanges; sunk in

"By the adoption of a current of air produced by means of fans "or other convenient apparatus, the process of evaporation may "be greatly accelerated."

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 14.—N° 1061.

PARK, James.—This invention relates to steam engines constructed on the principle of high pressure or otherwise; it is adapted to manufactories, works, and places where two or more engines are employed, and consists (1.) in connecting by suitable exhaust pipes, all such engines to one condensing apparatus, whereby each steam engine will be worked as a condensing engine, while its construction may remain simple as in high pressure-engines. The condensing apparatus must be of sufficient capacity to exhaust the air and steam from all the engines connected with it; the air pump and condenser are disposed with one of the engines; all communicate by branch pipes with the condenser; these branch pipes are each provided with an injection tap, in order that each engine may supply its own condensing water. 2. Relates particularly to adding a condenser and air pump to the steam engines coupled direct to the rag machines employed in the manufacture of paper pulp, according to the Specification of a patent granted to this inventor bearing date May 24, 1855, N° 1170; and in surrounding the cylinders of such engines with a jacket, into which exhaust steam is conveyed for the purpose of keeping the cylinder warm.

[Printed, 8*d*. Drawing.]

A.D. 1862, April 14.—N° 1063.

SPENCER, John Frederick.—This invention relates to the pumping arrangements of surface condensing steam engines, and consists "in combining the feed and condensing water pump in "the same barrel when an air pump and hot well are not used; "and in inverted cylinder surface condensing engines working two "vertical combined air and condensing water pumps, or two "vertical combined feed and condensing water pumps, or one "vertical single-acting plunger condensing water pump, and one "vertical single or double-acting feed pump from the two ends of "a cross head attached or connected to the main piston or "pistons by two or more piston rods; and also, in the latter

"description of engine, working one combined air and con-"densing water pump, or one combined feed and condensing "water pump from one end of a cross head attached to the main "piston or pistons by two or more piston rods, the one end of "which cross head having attached to it the pump rod or rods; "the other end may either be made so as to form a guide block, "or the guides may be fitted" to ensure parallel motion. The distance between the centres of the cylinders and air pumps can be varied to suit the length of stroke, or the clearance for the crank and connecting rod, without interfering with the diameters of the main pistons; also a better vacuum is ensured by keeping the barrels of the air pumps below the bottom of the condenser.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 17.—N° 1123.

TEMPERLEY, John Pugh.—(*Provisional protection only*.—This invention relates to the air pumps of steam engines, and consists in fitting a plunger or ram upon the piston rod of the air pump cylinder of condensing engines, or by other means connecting a plunger with the ordinary bucket, whereby the action of the pump is increased, and a portion of its work performed during the down stroke, which will admit of a corresponding reduction in the size of the pump. By this combination of plunger and bucket in condensing engines, the advantage of a more perfect vacuum is obtained than it would be possible to produce by the plunger alone.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 17.—N° 1130.

ANDERSON, William.—(*Provisional protection only*.)—This invention relates to tubular steam generators, and consists in the mode employed for fixing the bends which connect the ends of the tubes to each other; each bend is made with two sockets to receive the ends of two tubes; the ends of all the tubes in the group pass through side plates which keep them in position; at the back of each bend there are two projections, one opposite each tube end; the bends are forced on to the ends of the tubes by triangular plates, which rest upon one projection of each of three bends, so that when acted upon by a central stud or bolt which screws into the side plate they shall press equally on the three

resting points; plates, or bars bearing on the projections of two bends only may be used. The pressing plates or bars may have more than one central hole and be forced up with more than one bolt, and they may be connected with bars inside the side plates.

[Printed, 4d. No Drawings.]

A.D. 1862, April 19.—N° 1149. (* *)

PARKES, Alexander. — "Improvements in surface con-
" densers."

"Surface condensers are now commonly made with copper or
" brass tubes, and it is found in practice that these metals become
" more or less acted on when at work by the steam and grease,
" and consequently when the condensed or condensation water is
" used to feed the boiler, small quantities of salts of copper are
" introduced by it into the boiler; this causes corrosion to take
" place within the boiler, and not unfrequently considerable dam-
" age results." "Now my invention consists in coating the tubes
" with silver by means of an electro-plating process; the tubes
" may with advantage be silvered both inside and out, the princi-
" pal advantage is however, I consider, obtained by silvering the
" surface with which the steam comes in contact." "If ferrules
" are employed in fixing the tubes, as they usually are, the ferrules
" also should be electro-plated. Or, in place of employing tubes
" prepared in this manner, tubes prepared from sheet copper, or
" brass plated in the ordinary manner and bent up and soldered,
" may be employed, but I much prefer solid drawn tubes electro-
" plated."

[Printed, 4d. No Drawings.]

A.D. 1862, April 21.—N° 1164.

AMOS, James Chapman.—This invention, relating to a mode and apparatus for supplying condensers with water, in part applicable to blowers and rotary pumps, consists, 1 (as regards pumps), in providing ready access to the fan or impeller when applied to the injection of water into surface condensers. When placed within limited space, as, for example, on shipboard, it is desirable that facile means be provided for speedy access to the working parts. This is effected by making a segmental section of the case removable, including the upper couplings of the axle

bearings, so that the fan and axle on the removal of the segmental portion, which comprises about 120° of the whole circumference, may be lifted out. The fixed remainder of the case and the removable part are united by bolts through flanges with which each part is suitably furnished. 2, consists, when applying rotary pumps for injecting water into marine surface condensers, of drawing the water either from the sea or from the hold of the vessel. To effect this the pump is mounted on a suction box fitted with a divided sluice, the compartments of which are made to communicate respectively with the interior and exterior of the vessel by means of a slide valve which will cut off either or both supplies. In the event of leakage or shipping of water, the bilge water alone would be sent through the condenser, and after circulating therein, discharged through the vessel's side. Reciprocating pumps may also be applied in the same way, and the use of hand pumps (to a great extent or wholly) avoided, without putting any additional work upon the engine.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 22.—N° 1173.

SCOVILLE, George.—(*A communication from Augustus James Scoville and Augustus Hervey de Clercq.*)—This invention relates to pistons for steam engines, whereby the use of springs or other mechanical contrivances are dispensed with. There are two outside packing rings, which are placed in the usual way side by side between the piston plates; each of these rings is divided by an oblique saw cut; they encircle an inner ring, which is about $\frac{1}{4}$ of an inch thick, and as wide as the two outer rings together; it is divided by a straight cross cut to allow for expansion; within the ring there is a cast-iron valve ring of the same width; this valve ring is not divided, but it is externally furnished at regular intervals with a number of small ribs which extend across its periphery; they fit to the inside diameter of the inner ring, and endwise between the piston plates, so as to leave about $\frac{1}{32}$ of an inch of play; there are four slight ribs inside the valve ring, which fit into corresponding grooves in the body of the piston, these are to prevent the valve ring turning; two concentric series of small $\frac{1}{4}$-inch holes are drilled through both piston plates, the holes in one series to correspond and open respectively against each end of the outer ribs in the valve ring, and the other series

to open against the sides of the outer packing rings. When steam is admitted either above or below the piston, it enters the two series of holes in the respective piston plates; that which enters the inner series of holes, acts against the ends of the ribs on the valve ring, and by forcing the ring over, closes the holes on the other side; the steam also fills the spaces formed by the ribs between the valve ring and the inner packing ring, which causes the latter to expand, and act in the same direction against the outer ring packings; that steam which enters through the outer series of holes, presses sideways on these last named rings, so as to make a steam-tight joint on the other side. By this arrangement it will be seen that the steam presses divergently and laterally on the metallic packings, whereby a perfectly steam-tight fitting piston is formed.

[Printed, 8*d*. Drawing.]

A.D. 1862, April 24.—N° 1199.

ALLEN, John Franklin.—This invention relates to steam engine slide valves and valve gear, the object being (1) to give the steam a more open passage to and from the cylinder, and to effect the opening and closing of the ports with unusual rapidity, so that even at high velocities of the piston the full steam pressure may be established in the cylinder at the commencement of the stroke, and maintained during its continuance up to the point of suppression. Also completely avoiding back pressure in non-condensing engines, by the use of valves greatly reduced in size and extent of motion. A passage in the body of the slide valve passes over the cup and opens through the face at each end, whereby as soon as the valve begins to move, two passages are simultaneously opened into one port, which is double the area that could be uncovered in the same time and movement by the valve in ordinary use.

2. Employing separate valves for exhausting the steam from the cylinders; these valves are disposed in cavities between the steam chest and the cylinder; their movements are wholly distinct from the admission valves, which in action and effect are entirely uninfluenced thereby, although the movements of each are obtained from a single excentric which operates two rocking shafts, the respective motions of which through any desired portions of the circle are obtained after the principle of the "toggle

" joint," whereby more rapid motion is imparted to the valves at the times of opening and closing.

The invention further consists in the use of a vibratory link lever, operated by a single excentric, the throws of which. when suitably arranged, produce movements possessing the characteristics of " Stephenson's link motion," and in such manner, that while the steam valves are operated by the link to perform the desired cut off, the exhaust valves receive motion from that part of the link which is best suited to give them correct action.

[Printed, 1*s*. Drawings.]

A.D. 1862, April 25.—N° 1214.

ELDER, JOHN.—This invention relates to steam engines of the class known as Randolph, Elder, & Co's combined cylinder engines, wherein high and low pressure cylinders operate with conjoint action; it also relates to steam boilers, and consists (1) in arranging the steam boxes, valves, and ports between the high and low pressure cylinders, so that when the valve is admitting steam from the former to the latter, only one port or a comparatively small admission way is uncovered, whilst the same length of travel of the valve in the contra direction, will open a comparatively large communication with the exhaust; two valves are employed, acting in separate chambers on one spindle which passes through a gland between them; each valve seating has two inlet ports and an exhaust port communicating with the low pressure cylinder.

2. Relates to the valve reversing gear in the same class of engines, as regards the mounting of the excentric that works the high pressure valves, which has hitherto been directly connected to the valve shaft by a spiral groove and feather; it is now mounted on a tubular boss, which is fitted internally with a spiral feather, to correspond with a spiral groove in the valve shaft on which it slides, so that the relative position of the excentric with regard to the main crank, may be altered by a longitudinal movement of the valve shaft.

3. Relates to the working of engines constructed with four cylinders disposed at suitable angles, and shown as applied for driving paddle wheels. The relative sizes of the cylinders differ considerably; the smallest cylinder by means of two simple cut off valves on one spindle, receives very high pressure steam

from the boiler, whence after operating the piston it exhausts into the second sized cylinder, which is placed beside it, both on the same angle; the second cylinder exhausts into an intermediate chamber, where it may be superheated; thence by a pipe it passes to the other side of the engine, and through cut off valves into the third sized cylinder, where, after operating, it is exhausted into the largest cylinder and afterwards condensed. The crank shaft has two throws, one at right angles to the other; the smallest and the largest cylinder on opposite sides of the shaft are connected to one throw, and the second and third sized cylinders are disposed in the same manner to act upon the other throw.

4. Relates to the general arrangement of the parts of a four cylinder engine combined with surface condensers. Four inverted cylinders are disposed in a line over the crank shaft; the two outside are worked with high pressure steam, which is exhausted into the two middle cylinders which are of much larger capacity, and discharge their steam into two surface condensing chambers, so placed underneath between the high and low pressure cylinders respectively as to form their resting place. The condensing tubes are disposed horizontally, accessible from one side, and the bottoms of the casings are arched to accommodate the main shaft. An air pump is attached to the side of one condenser and the cold water circulating pump to the side of the other, whilst the feed water and bilge pumps are attached respectively to the fore and aft sides of the air and circulating pumps; they are connected by crossheads and worked by levers on rocking shafts, which are mounted in bearings fixed to the condenser sides, and actuated by levers linked to the slide blocks of the high pressure piston rods; the valve rods are worked by rocking shafts mounted on the top of the cylinders, actuated by excentrics reversed by the spiral groove and feather gear already described. A modification with three inverted cylinders is also shown.

The boilers are of the class wherein the fire gases act directly on a series of water containing tubes so disposed in a close continuous spiral coil within a coniformed furnace, that the water may circulate downwards, contrary to the direction of the fire gases, whereby the formation of steam is prevented in those parts of the coil exposed to the greatest heat by the superincumbent weight of the water above; the water flows into a side vessel provided for the disintegration of the steam. The circu-

lation of the water is kept up by oblique revolving blades or screw pump, interposed within the upper connection between the vessel and the boiler.

[Printed, 2s. 10d. Drawings.]

A.D. 1862, April 25.—N° 1215.

SHAW, JOHN.—(*A communication from John Shaw the younger.*) —This invention relates to equlibrium valves for steam engines, an equilibrium and flexible piston, and a combined governing and indicating apparatus. The equilibrium valve is mounted upon the end or cover of the cylinder; it consists of two circular parts, equal in area and fixed apart upon a spindle; the lower or valve part is bevelled on the edge to correspond with the angle of the valve seat, which opens to the cylinder; the upper part acts as a piston in a small cylinder formed in the valve case; the spindle passes out through a stuffing box on the end of the cylindrical part of the case; the space between the two parts of the valve is open to the steam which presses equally on both, consequently a slight power operates the valve. The spaces below the valve and above the upper piston part, communicate through a central hole in the spindle, so that the pressure under the valve when the steam is cut off, is balanced by the steam which is admitted through the spindle to the space above. A similar valve is mounted on the cylinder end, to work the exhaust independently, so that the cut-off does not in any way interfere therewith.

The flexible piston is formed in two parts, one constituting the upper plate, and the other the back plate; each has an inner rim, around which the packing grooves are sunk; the back plate is provided with an annular flange, which is fitted to slide within the rim of the upper plate; between the plates are disposed a number of spiral springs, the collective resistance of which is somewhat superior to the maximum of steam-pressure usually worked; the plates are suitably bored and fitted on the piston rod, its end being screw threaded to receive a nut, wherewith the plates are forced together to the pressure point, but will yield further whenever from any cause the piston touches the cylinder ends.

The governing apparatus is described under different arrangements of details. It consists of a circular rotating box or pulley,

wherein a weight acts centrifugally upon the resisting power of a reacting spring, which is attached to the inside of the rim. "There being no joints, lever, or other connections between the "spring and the weight put in motion, an apparatus so con- "structed is as sensitive and free from friction as a spring-weigh- "ing balance."

The indicator is fitted to act upon the same principle as the governor; the one by means of a sliding collar operating the valve, and the other by equivalent means operating an indicating finger.

[Printed, 1s. 4*d*. Drawings.]

A.D. 1862, April 29.—Nº 1256.

TIZARD, William Littell.—This invention relates to the construction of apparatus for heating, cooling, and condensing purposes, and consists in casting a rectangular cellular plate closed on three sides; two of its contiguous sides have flanges top and bottom, the other two sides are without flanges, and project a little more than half the thickness of the others. The interior of the plate is furnished with parallel partitions alternately short at one end, whereby a tortuous channel is formed running to and fro from side to side in continuity from one end of the plate to the other; the faces of the flanges are planed and have holes drilled through, so that when a number of these plates are piled one on the other, the holes shall correspond to receive long bolts which pass through each plate of the pile, and by which they are drawn tightly together; the open sides are then planed, and closed by a steam tight cover; all the divisions formed by the separate plates communicate, and inlet and outlet pipes for steam and water or other fluid are suitably attached. The above forms one-half the apparatus. Another pile of plates similar to that described is furnished with wheels or rollers, and disposed upon a tramway, so that it may without labour be separated as often as the apparatus requires cleaning and be brought up again to the first pile, which is fixed in its position. The plates forming the moving pile are pushed in or interserted between the plates of the fixed pile, so that closed continuous shallow channels are formed between them throughout the whole series, the sides being brought in contact to prevent leakage or escape. The fluid to be heated, cooled, or condensed, courses through one channel, and the heat-

ing or cooling medium through the others in contrary directions. The configuration of the channels may be altered by varying the form of the partitions; and varied arrangements and the advantages of their application are referred to as required to modify and adapt the apparatus to those general purposes within the circuit of its usefulness, including apparatus for treating "brewers' "worts," when they are undergoing vinous fermentation or cleansing.

[Printed, 10*d*. Drawing.

A.D. 1862, April 29.—N° 1257.

CHILDS, David Monroe.—(*A communication from James Mills Ray, John Hooper Redstone, and Albert Ellis Redstone.*)—This invention relates to the steam chests and valves of steam engines, which valves reciprocate more or less semi-rotative motion; they may be described as slightly tapering plug valves placed in a correspondingly formed cylindrical socket, which is chambered or hollowed at different places in its length, to correspond with the steam supply pipe and the cylinder ports; suitable slots and openings in the valve bring the chambers into or shut off communication with each other, and with or from the ports and passages at the proper moment by the reciprocations of the valve, which is disposed at right angles with the axis of the cylinder, and is made steam tight in its socket or cylindrical steam chest by means of a stuffing box, the gland of which forces the packing down upon the shoulder of the valve, half a turn of which will reverse the motion of the engine. A proposed arrangement of these valves is shown and described as applicable to coupled cylinder engines, in which a key valve is introduced for reversing; this valve is so placed in the steam passage that the steam always passes through it, and receives its direction according to the position of the valve, which is also made steam tight by a stuffing box.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 30.—N° 1268. (* *)

DAVIES, George.—(*A communication from François Ferdinand Auguste Achard.*)—"An improved electric apparatus applicable to "various useful purposes."

The employment of the said electric apparatus as an automatic regulator. A "two-armed click" acts upon a ratchet wheel of a peculiar construction in two ways, so as to cause it to turn in two different directions, according to whether the electric current traverses the coils of a certain electro-magnet or not. In feeding steam boilers to a constant level, the circulation or interruption of the electric current is caused by the rising or falling of the float; the above-mentioned ratchet wheel, according to the direction of its motion, opens or shuts the feed cock, and thus maintains the water at a constant level; the breaking of the electric circuit opens the feed cock, and sounds an alarum, "when the level rises or "falls beyond certain limits," by means of additional electric contact pieces. Similar arrangements are used when the electric automatic regulator is applied to a manometer, thermometer, or hygrometer.

[Printed, 1s. Drawing.]

A.D. 1862, May 2.—N° 1299.

BROOMAN, Richard Archibald.—(*A communication from Pierre Antoine Delafond and Joseph Corrade.*)—This invention relates to apparatus for superheating steam, which "consists of "cast iron hollow rings, by preference three, each divided into "four equal segments; the rings are of different diameters, and "are place stepwise one above the other, and at such distances "apart as will allow the products of combustion free circulation, "connection is maintained between the rings by bent tubes. "The first of these hollow rings is of the same internal diameter "as the flue in which the superheater is placed. When the "superheater is fitted to a marine engine steam enters directly "from the boilers and passes to the cylinders. Valves for cutting "off and admitting the steam are fitted so as to enable the steam "to pass directly from the boilers to the cylinders in the ordinary "manner, without passing through the superheater, and also to "enable part of the steam only to pass through the superheater "& be afterwards mixed with moist steam. Each tube is free to "expand and contract independently of the others, and has only "to bear its own pressure and that on the ring. This result is "obtained by the tubes being bent, which renders them slightly "elastic, and allows them to play without injuriously affecting "their joints. The form of the tubes may vary, and from their

"position the shape and position of the compartments between "which the bent tubes form a communication may also vary; "thus, instead of the two neighbouring compartments of the "same ring communicating, they may form a communication "between two vessels of any form, separated or contiguous, one "receiving steam from the boiler, the other dry steam through "the superheater."

[Printed, 8*d*. Drawing.]

A.D. 1862, May 5.—N° 1326. (* *)

PARKINSON, THOMAS, NORMAN, JOHN, and COTTAM, RICHARD.—(*Provisional protection only.*)—"The nature of our "invention consists in constructing the grate-bars of the furnaces "of steam boilers of steel or wrought-iron tubes connected at "their ends to water-chambers. A constant supply of water is "introduced into these tubes and chambers by suitable pipes, "and the steam generated in them is carried off into the interior "of the boiler by a pipe or pipes passing from the chamber near "the bridge along the flue to the back end of the boiler, or in "any other convenient manner."

[Printed, 4*d*. No Drawings.]

AD. 1862, May 5.—N° 1337.

ROSCOE, JAMES.—This invention relates to a lubricator for steam engines, which consists of a small hollow vessel cast with two projections at the side, the top one hollow, and the other solid, which is tapped to receive a screw wherewith the vessel is vertically fixed to the front of the boiler; the upper tubular projection has a shoulder or collar formed on it; the end is threaded outside; this part enters the boiler plate up to the shoulder, and is secured by an annular nut inside the boiler, where the end is attached by a union joint to a pipe which com municates with the steam space. A stop cock is fitted to the bottom of the vessel, for drawing off any accumulation of water; above the central chamber a cup or recess is formed at the top of the apparatus; this cup is for receiving the tallow or lubricant, which, if of a plastic or solid nature, must first be liquefied by heat; the lubricant sinks through a hole in the bottom of the cup into the chamber, which may be filled up to the steam pipe; the hole is then closed by a screw plug to the end of which there is a

small copper tube open at the lower end, which reaches nearly to the chamber bottom; another branch pipe from the top of the chamber communicates with the valve chest and engine cylinder; the steam on its way to the engine passes through the upper part of the chamber, whence it takes with it particles of the melted tallow or lubricant.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 5.—Nº 1340.

JOHNSON, JOHN HENRY.—(*A communication from Joseph Harrison.*—This invention for steam generators is supplementary to the Specification of a Patent granted to this patentee, bearing date 30th August 1859, No. 1970, and consists in a particular arrangement or disposition of a number of generating tubular chambers, formed with transverse open passages by a series of "units of construction;" these chambers are ranged close beside each other within the sides of the furnace, resting upon a bed plate and inclining backwards at an angle of about 75°; the fire-bar surface slopes downwards from the front, being at right angles to the furnace front, which inclines correspondingly with the chambers, and the tiers or several series of chambers with which the body of the furnace is filled, and which extending from back to front, are also correspondingly inclined immediately over the fire; each successive series above the lowest, rests at the front ends upon the series below, the back ends of each series being kept more apart by packing blocks placed between them. The parts or units of which the chambers are composed consist of short cast-iron corrugated tubes, which present in such form increased heating surface; both ends of each unit are made true and parallel by planing or otherwise, in order that when the edges are arranged end to end, they can by means of long bolts, which pass through the chambers from end to end, be forcibly drawn together and thus form a series of transverse steam tight joints. (See abridgement of former patent, J. H. Johnson, A.D. 1859, No. 1970, Steam Engine series, part 1.). Some of the units are cast with longitudinal diaphragms to form distinct channels for the water, which is thereby made to circulate through the chambers in opposite directions; the water level is established in the two upper tiers, in which ball valves are introduced to regulate the flow of water. By means of metal or fire-brick plates,

an alternate backward and forward direction is given to the flaming gases between each series of chambers; the furnace bridge is divided by a narrow passage for the admission of air from the ash pit. The generator is enclosed by a casing of metal or brick, which as well as the furnace sides is lined with fire-clay. A combustion chamber is formed at the back of the bridge. All the chambers are in communication with each other, and the upper series with a steam dome which is superposed on the top of the apparatus, where also is the chimney up-take.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 12.—N° 1422.

JOHNSON, John Henry.—(*A communication from Joseph Harrison.*)—This invention relates to a certain mode of construcing and arranging the moulds and cores employed in casting metals. It is particularly applicable to the casting of the units employed in the construction of the steam generator described in the Specification of prior Letters Patent granted to this patentee on or about August 30th, 1859, N° 1970. The moulds are made in several parts, entirely of metal or heat-resisting porous material, or partly of metal and partly of sand or other suitable material; the several parts are in all cases so combined as to allow for the free contraction of the cooling metal, and if necessary prevent the chilling or hardening of those parts or surfaces of the casting which are afterwards to be operated upon by cutting tools or otherwise. Facile means are also provided for the accurate adjustment of the core within the mould, consisting of stationary guide pins inside the mould arranged to correspond with tubular metal sockets in the core. The cores are transferred from the core box to the interior of the mould without removing the upper part of the core box, whereby accurate adjustment is ensured within the mould previous to its removal.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, May 14.—N° 1450.

PORTER, Charles Talbot.—(*A communication from Charles Richards.*)—This invention relates to an improved apparatus for indicating the action of steam in an engine cylinder whereby the pencil or marking point is made to move in straight lines, so that its delineations can be measured with accuracy. "A small steam

"cylinder in which a piston moves, having its movements regu-"lated by a spiral spring, is arranged and constructed in a manner "similar but much shorter than an ordinary indicator. To the "outside an arm is secured to support a cylindrical paper holder, "which receives the proper reciprocating movements in the usual "manner. Around the upper part of the cylinder case a ferule "is made, to which are attached two arms to support the fulcrum "pins of two delicate levers or radius bars. These levers are "connected by a lever or link, in the centre of which a pencil "holder is attached, and the levers are so proportioned that the "pencil holder and consequently the marking point of the pencil "is caused to move in a straight line in the same manner that "the 'parallel motion' of a steam engine acts upon the end of "the piston rod in steam engines. The rod of the piston moving "in said cylinder is connected by means of a forked link to one "of the above-mentioned delicate levers, at a point distant from "its fulcrum about one-fourth the length of the lever, or at any "other point which may be desired, whereby the pencil receives "from the piston a range of perpendicular motion about four "times greater than that of the piston or any other desired rela-"tive movement corresponding with the point of attachment on "the lever. The movements of the pencil's point in a straight "line permits the use of a cylindrical paper holder, which is the "most compact, convenient, and easily operated."

[Printed, 8*d*. Drawing.]

A.D. 1862, May 19.—N° 1514.

LEE, Jesse.—(*Provisional protection only.*)—This invention relates to the construction of traction engines. 1. To the tractive wheels, the peripheries of which are furnished with transverse bars of metal in order to insure greater hold of the wheels upon the ground, and so prevent all tendency to slip. Also to a mode of connecting the felloes of the two tractive wheels by a cylindrical shell, so as to give them the appearance of one roller, and cause them to act and work in a similar manner. 2. Relates to balancing the boiler across the axle, and (as may be necessary according to the level) by means of a hand lever or screw convenient to operate near the fire-box elevate or lower the end of the boiler in *relation to* the water level, as the inclination of the road or way *may require*. 3. Supporting the intermediate wheel, which gears

into and connects the spur wheel with the pinion on the fly wheel shaft, by means of links attached to the shaft and to the axle-tree.

[Printed, 4d. No Drawings.]

A.D. 1862, May 20.—N° 1519.

MENNONS, Marc Antoine François.—(*A communication from Guiseppe Velini.*)—This invention relates to apparatus for applying screw power to the locomotion of railway trains as a means of facilitating and controlling their movement in the ascent and descent of steep inclines. A longitudinal wooden rail bolted down to sleepers is centrally disposed between the ordinary metal rails. On this wooden rail at regular intervals are mounted on upright centres a series of metal rollers. Beneath the tender is longitudinally placed a cylinder, whereon, winding from end to end round its circumference, is fixed a pair of helical bands; these bands project from the surface and form a double threaded screw, the pitch of which is a divisional part of the respective distances between the rollers upon the wooden rail. Rotary motion is given to the helical drum by two vertical steam cylinders on the tender, to which steam is supplied from the engine boiler. By means of four small wheels acting against the inside of the metal rails, the lateral vibrations of the tender are limited. When ascending an incline, the drum is set in motion, and by means of the continuous action of the helical bands against the successive peripheries of the fixed rollers on the rail, a progressive motion is acquired and communicated to the whole train. In descending inclines the apparatus may be used to moderate the speed either without or in conjunction with breaks. Means are applied for obviating the shock occasioned by the sudden contact between the helical bands and the rollers when first set in motion. An arrangement of a break is described for checking the motion of a train accidentally detached from the engine while ascending or descending an incline. Also a mode of relieving the drawing and coupling links of the first carriages in a train from the additional strain brought upon them whilst ascending inclines. The invention also extends to the arrangement of a series of transverse partitions in the water space of the boiler, for the purpose, when ascending or descending inclines, of dividing the normal water level into a series of short levels or steps, in order to prevent an undue flow of water to one or other end of the boiler.

[Printed, 1s. 4d. Drawings.]

A.D. 1862, May 22.—Nº 1551. (* *)

ROBERTS, William, and GREENACRE, Thomas. — "Im-
"provements in cocks or valves for steam or other fluids."

"In constructing cocks or valves according to our invention "the stem or spindle of the valve is caused to pass through a "stuffing box at the top of the barrel or body within which the "valve works. The stuffing box is divided from the barrel or "body by a partition, through which the stem or spindle of the "valve passes; and there is a collar on the stem or spindle which "is enclosed between the upper side of the partition and the "bottom of the stuffing box, which is screwed down into its "place over the collar, the interior of the stuffing box having a "screw thread cut in it to admit of this being done. The "upper or outer end of the stem or spindle of the valve has a "handle fixed upon it, by means of which it may be turned "round, and the inner or lower end of the stem or spindle has "a screw thread formed upon it which fits into a female screw "formed in the upper end of the piece forming the valve, and "the valve, which it is preferred should be conical at the bearing "surface and have a conical seat, can be raised off its seat by "turning the stem or spindle, and causing the screw thereon to "descend through the female screw. The valve when it is raised "is received into the upper part of the barrel or body, where "there are projections or ribs which guide the piece forming the "valve, and prevent it turning whilst it is being raised or "lowered. The seat of the valve is made separate from the "barrel or body, and is screwed into its place at the lower end "thereof from the outside. The outlet for the fluid to pass away "from the cock or valve is formed in one side of the barrel or "body."

[Printed, 10*d*. Drawing.]

A.D. 1862, May 26.—Nº 1568.

BRAKELL, Christopher, HOEHL, William, and GUNTHER, William.—(*Provisional protection only.*)—This invention relates to steam and other motive engines. 1. An arrangement of mechanism for actuating the valves so that they work the steam at various degrees of expansion, such valves being always closed either by steam pressure or springs, excepting when acted upon by the mechanism. Motion from the crank shaft is

transmitted to a slotted lever carrying a movable die to which one end of a connecting rod is jointed, the other end being connected to a lever arm fixed on a rocking shaft, the oscillations of which vary according to the positions of the die in the slotted lever. Projecting tappets upon an arm fixed on the rocking shaft so act upon levers connected with the spindle of the valve, that the valve, which always opens at the same point, is only opened when the movement is in the right direction, the "cutting off" being regulated by the action of the tappets on the levers, which is more or less, according to the oscillations of the rocking shaft. The die in the slotted lever may be set by hand or moved by a governor or other regulating mechanism.

2. Relates to rotary "steam engines or wheels" of the description patented by Mr. Christian Schiele in the years 1852, N° 13965, and 1855, N° 1693, and consists in reducing the high velocity of the turbine wheel, which is due to the velocity and pressure of the steam or motive power, by passing such steam or power in succession through a series of turbine wheels, the steam or power passing from the first to the second, thence to the third, and so on.

[Printed, 4d. No Drawings.]

A.D. 1862, May 26.—N° 1576.

HUDDART, George Augustus.—This invention relates to means for superheating steam in such measured quantity as will supply a steam engine. Steam, by the aid of a force pump, is taken from an ordinary boiler and forced into a superheating chamber, so placed within a flue or furnace that the flaming gases shall play around and through longitudinal fire tubes, with which it is filled, whereby the temperature and elastic force of the steam, by contact with the internal heating surfaces within the chamber, is rapidly and economically increased. A high initial force is then given to the steam, without requiring a corresponding resistance in the boiler where it is generated, the power of resistance being confined to the superheater, which as compared with the boiler is of small capacity; thus whilst steam is raised at a maximum low pressure of 25 lbs. per inch in the boiler, it may be supplied from the superheater to the engine at 50 lbs. pressure, and all, or nearly all the heat required to raise the extra pressure,

may be obtained from the waste heat passing off in the flues from the boiler furnace.

[Printed, 4d. No Drawing.]

A.D. 1862, May 28.—N° 1605.

HIRST, JOHN, junior, and TAYLOR, ENOCH OPENSHAW.—This invention relates to steam boilers and other evaporating vessels, and consists in forming within a horizontal cylindrical boiler, a succession of chambers united by multitubular groups of fire-tubes. The chambers are so divided by vertical water tubes or by vertical water space partitions, that repeated separation and re-admixture of the products of combustion is effected as they course on through the successive chambers and multitubular groups to the chimney flue. The tubes forming each successive group increase in diameter from the first group nearest the furnace. The tubes are flanged round at one end to fit against the external surface of one of the tube plates, and are turned down to a shoulder at the other end which comes against the inner surface of the other tube plate, the holes therein being slightly countersunk from the opposite side, against which the tube ends are opened out and clinched.

Engine cylinders are so surrounded with metal casing as to form flue passages, around which the products of combustion are made to circulate before they reach the chimney. Scrapers are used to remove accumulations of soot from the heat absorbing or transmitting surfaces.

[Printed, 10d. Drawings.]

A.D. 1862, May 28.—N° 1608. (* *)

BLACKMORE, WILLIAM, and LAMB, HENRY.—"This invention has for its object improvements in burning limestone and "generating steam. For these purposes, in order more advantageously and economically to burn the fuel used, whether coal, "turf, or peat, when generating steam, limestone is introduced "into and burned in ordinary steam boiler furnaces, by which "lime is manufactured at a cheap rate, whilst the fuel employed "is found to be more effective in generating steam than when "burned in the same furnaces without the introduction of limestone."

[Printed, 4d. No Drawings.]

A.D. 1862, May 29.—N° 1613.

BOETIUS, Henning.—(*Provisional protection only.*)—This invention, relating to a mode of cooling liquids and condensing steam, consists in placing cold solid substances, such as slates, tiles, strips of metal, glass, and other material, within large open casks for cooling liquids, and within closed vessels for condensing steam. The casks or vessels being so filled, the liquid or steam is admitted near to the top and passes out at the bottom; the heat contained in the liquid or steam during its permeation through and amongst the solid substances is imparted thereto. The operation is discontinued when the temperature of the solid substances within the casks or vessels approaches the heat of the liquid or steam, then a current of cold water is admitted at the bottom, which flows up amongst the solid substances, passing out at the top for use as heated water, it having absorbed the heat contained by the solid substances, which becoming thereby reduced to their normal temperature, the hot liquid or steam is again admitted to the downward flow. For continual condensing purposes two vessels are employed, each vessel alternately condensing and being cooled, such vessels being packed with thin metal strips of wrought or cast iron.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 4.—N° 1683.

ALLIBON, George, and SNELL, Edward.—This invention relates to the construction of surface condensers and superheaters. The apparatus consists of a rectangular vessel, so divided by a tube-plate partition as to form a narrow chamber at one end; this narrow chamber is subdivided by a series of cross plates into a number of small cells, which are very shallow but extend from side to side of the apparatus; these cells separately embrace two rows of holes in the tube plate, and are alternately connected with the pipe which conveys the exhaust steam from the engine, and intermediately with that pipe which conveys away the residue of steam, air, and water of condensation from the apparatus. The main body of the condenser is filled with bent tubes disposed in horizontal tiers one above another; these tubes are bent short over at the centre so as to form two prongs of equal length, which are brought parallel and nearly close together; they are all so arranged and fixed in the tube plate that one end of each tube

shall open into a cell which receives exhaust steam, and the other end of each tube into an intermediate cell connected with the outflow, so that the only passage for the exhaust steam is through the tubes. A constant stream of cold condensing water is kept up through the apparatus, coursing within from side to side around and amongst the tubes.

The apparatus is described as applied to surface condensing, but the same principle with suitably modified arrangements may be employed for superheating steam and for heating feed water.

[Printed, 10*d*. Drawing.]

A.D. 1862, June 4.—N° 1688.

SCHEUTZ, EDVARD.—This invention relates to rotatory engines, is supplementary to Letters Patent which were granted to John Henry Johnson, dated 30th October, 1860, N° 2656, and consists in constructing such engines to work expansively if desired. "For "this purpose a steam port is made to open into one end of the "cylinder at the side thereof communicating with the valve "chest, and another port communicating with the former one "and the steam pipe, and the end of the piston at that part has a "number of chambers or recesses formed in the surface thereof, "such chambers or recesses being made to travel in front of the "steam ports above referred to, and consequently they alternately "open and close the communication between those ports, thereby "cutting off the steam at any previously determined part of the "revolution of the piston. A direct steam communication is also "made with the valve chest, and a cock or valve is fitted therein, "so that the steam may either be led at once to the valve chest "by opening the cock, or the cock may be closed and the steam "diverted through the separate passage and through the steam "ports above referred to, in which latter case the engine will "work expansively."

[Printed, 10*d*. Drawing.]

A.D. 1862, June 4.—N° 1689.

HUSTON, SAMUEL.—(*Provisional protection only.*)—This invention relates to safety valves; two valves are used on the same spindle, one being larger in its area than the other, the steam acting upon them "in such manner as to press one towards its "seat and the other off its seat. The spindle or stem of the two

"valves is hollow from the upper end thereof to nearly the lower "end thereof, in order that it may receive a short rod, which is "pin-jointed to the weighted lever, by which the valves are pressed "into their respective seats. Below the seat of the lower valve is "a pipe by which the steam which escapes from under the lower "valve is conducted away, and, if desired, the steam passing the "upper valve may also be conducted away by a pipe, or it may "be allowed to escape directly into the outer atmosphere. By "these arrangements the steam in a boiler is constantly tending "to open the valve having the larger area, whilst the steam is "tending to close the valve having the smaller area, and the "weighted lever is constantly tending to press both the valves to "their seats."

[Printed, 4*d*. No Drawing.]

A .D. 1862, June 6.—N° 1705.

DEATH, Ephraim.—(*Provisional protection only.*)—This invention relates to common road locomotives or traction engines, and consists, (1), in fixing the engine on a bed connected to square plates at each end of the boiler, instead of to the shell or fire-box, in order to avoid expansion about the joints and bearings, and in such manner that the engine may be readily disconnected from the boiler. 2. To avoid heating the bearings, mounting the axle in two side plates which extend the length of the boiler, and are fixed to the square end plates. 3. Forming the axle with journals which work in bearings between the side plates and the wheels; the bearings are fixed in a frame which extends the whole length of the engine; the journals are made to form pivots, on which the hind part of the frame rests, when, by suitable apparatus, the front end of the boiler is raised or lowered. 4. Applying the power for turning a steering wheel, near to its axis, instead of in the usual way above the wheel; a flanged ring which forms a fore carriage is fixed to the side frames, and a movable ring (with teeth formed round a part of its circumference, which gear into the turning pinion), works on the face of the fixed ring; brackets are fixed to the movable ring, and between them blocks slide, and serve as bearings for the axle, a metal or india-rubber spring being placed between the upper side of each block and the under side of the movable ring. 5. Constructing the framing to form hollow chambers for the purpose of carrying water. Lastly, using the

combined power of two distinct engines and fly-wheels, so coupled by means of a clutch and lever that they can be disconnected and employed separately to drive machines in opposite directions.

[Printed, 4d, No Drawing.]

A. D. 1862, June 7.—N° 1713.

HOOK, CHARLES.—This invention relates to engines of the oscillating class, and consists in regulating the opening and closing of the ports for the induction and emission of steam by the motions of the cylinder, so that no slide valve is required; two passages communicating with the steam pipe are formed in one of the trunnion bearings, and in the trunnion corresponding holes are cast, so that the apertures in the trunnion coincide with those in the bearing. In the opposite trunnion, two passages open to corresponding passages in the bearing, through which the exhaust steam passes down the bearing support into the exhaust pipe. The cock or valve which regulates the admission of steam to the cylinder is circular, hollowed out on two sides, by means of which when turned obliquely in one direction steam is admitted to the passage communicating with the bottom of the cylinder, which moves the engine forward. To reverse the engine the cock is turned on the opposite side, and the steam admitted first above the piston, which changes the direction of motion; when the handle is quite straight in position both passages are closed, and the engine ceases to work.

[Printed, 8d. Drawing.]

A.D. 1862, June 9.—N° 1722.

JOYCE, ARTHUR JOHN.—This invention relates to the circumclusion of furnaces, lamps, and other apparatus in use for the purposes of combustion, which is supported in such furnaces and apparatus, by the introduction of compressed air through suitable pipes and passages, governed by ingress valves opening at the lowest level, and egress valves to take from the highest part of the furnace chamber the gaseous and fuliginous residues, which are discharged through a pipe descending into, near to the bottom of a closed vessel three parts filled with water and furnished with a valve. The compressed air is admitted under the grate so as first to pass up through the burning fuel. In these furnaces, one, two, or more operations may simultaneously be kept in pro-

gress; the furnace described contains a melting pot directly over the fire, openings for introducing metal bars for forging or welding, and a vertical cylindrical steam boiler containing clusters of horizontal heating tubes reaching from side to side, through which after the hot current has passed, it discharges itself through the egress pipe beneath the water in the closed vessel. Suitable arrangements are made for feeding by means of a closed hopper. Examples of the invention as modified for application to goldsmiths' furnaces, reverberatory, melting, boiling, and steam generating furnaces, and to enclosed lamp apparatus for lighting purposes, are described and illustrated.

[Printed, 10*d*. Drawings.]

A.D. 1862, June 11.—N° 1734.

SHAND, James, and MASON, Samuel. — This invention relates to the construction of steam boilers, applicable to fire and other engines and purposes, the object being to prevent the burning of the metal plates of the inner cone above the water line, which is found to take place in the boilers described in the Specification of a patent granted to these inventors, bearing date April 11, 1861, N° 889, which boilers are of the upright class, and consist of an external cone-formed shell containing an inner cone, which forms the fire-box and rises to the chimney; the annular space between the two cones below the water line containing water, and the upper space, steam. According to the present invention, the inner conical form of the furnace is terminated below the water level by a crown plate, from the centre of which the flue opens into a parallel tube, which rises to the top of the boiler, and its continuation upwards forms the chimney. A double casing communicating with the pump is formed round the parallel flue tube, into which the feed water is forced and is heated as it rises to the top of the inner casing, where it flows over into the outer casing and descends therein, flowing out of openings at the bottom into the water spaces of the boiler.

[Printed, 8*d*. Drawing.]

A.D. 1862, June 14.—N° 1769. (* *)

SAWYER, Joseph, and PADGHAM, George.—Improvements in steam boiler and other furnaces.

"This invention, in the first place, consists in the use and "adoption of fire-bars, each of which are curved in the upper as "well as the under surface thereof, each of such bars having "projections at each side, so that when one bar is put in position "by the side of another these projections may fit or nearly fit "against each other, leaving openings between them, producing "in effect a number of air tubes or passages admitting the air to "the fuel in the furnace to assist in the more effectual combustion "of said fuel."

"In the second place, instead of the usual fire-bridge, we have "a furnace plate placed in a sloping direction, and construct the "same hollow, that is, with a chamber or air space at its back; "and at the part below the level of the fire-bars, which part "(below the fire-bars) has a valve, which may be opened (if "thought desirable) from the front of the boiler by a lever "handle, so as to admit the cool atmospheric air to the said air "space, whence it passes modified in temperature into the furnace "by reason that the said furnace place is open at the top, and "thus we are enabled to effect the more perfect consumption of "smoke."

"In the third place, we also use a furnace door, which is con-"structed with two openings therein, which can be closed with "slides, the upper one having a hopper before it, so that the fuel "may be supplied to the furnace by moving the upper slide to "open the top opening."

[Printed, 10*d*. Drawing.]

A.D. 1862, June 16—N° 1779.

ALLAN, JOHN FLEMING.—This invention in connection with furnaces, relates to arrangements for preventing smoke and economizing fuel. The boiler or vessel may be properly disposed over a brick furnace, or when the invention is applied to a boiler with an internal flue and furnace, the latter may be constructed to project somewhat in front. The apparatus consists of a plate curved to the form of the furnace roof, and so fixed a short distance below it, as to leave a thin regular space between, which opens to the atmosphere in front above the furnace door, and extends into the furnace a considerable distance over the fire towards the bridge; the upper part of this curved plate is clustered over with fine tapering metal projections, which bristle up

to the furnace roof. When the furnace is in operation, the curved plate being disposed immediately over the fire, becomes extremely hot, and by conduction, all the bristling projections upon it; as the air current passes through them, they impart thereto a high degree of temperature, so that it enters the furnace at the inner end in a highly heated state. This thin sheet or current of rarified air commingling with the gaseous and other products of combustion, produces increasing heat along the top of the flue or the boiler bottom, effecting thereby an increase in the production of steam and the consumption of all smoke. Instead of the cluster of projections, the curved plate may have tortuous passages on the upper surface formed there by projecting ribs.

[Printed, 8*d*. Drawing.]

A.D. 1862, June 17.—N° 1789.

MAKINSON, Alexander Woodlands. — This invention relates to locomotive and stationary engines. According to the ordinary construction of such engines, the connecting rods are coupled to crank throws or crank pins, which describe a circle round the central driving axle when the engine is in motion. The coupled end of the connecting rods, and the crank pins of engines constructed in accordance with this invention, do not describe a circle, but are caused to move elliptically round the centre of the axle, the major diameter of the ellipse described being on the horizontal plane of the axle centre. Various contrivances may be adopted to accomplish this elliptical circuit; that which is described, consists in coupling the connecting rod to a movable crank pin, which is constrained to slide to and from the centre in a radial slot formed in the crank arm, by means of elliptical guides fixed to the framework on each side of the crank coupling. The drawings exhibit the invention adapted to a locomotive with a single cylinder, and to one fitted with two cylinders; in the former case the free end of the connecting rod is coupled to a single throw crank (mid-length on the axle) between two fixed elliptical guides, and in the latter case, the connecting rods work outside the driving wheels, a slot to receive the movable crank pin being radially formed through the boss of each wheel which revolves between elliptical guides attached to the side frames.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, June 19.—N° 1805.

HOWAT, Andrew.—This invention relating to water gauges, cocks, and blow off taps, consists in forming a longitudinal groove along the conical surface of the plugs of such cocks and taps, and fitting into such groove a scraper, for the purpose when the plug is turned, of scraping from off the inner surface of the body or barrel of the tap or cock, all calcareous or sedimentary matter which may be accumulating therein, whereby such taps are either rendered inoperative or require constant cleaning. In some cases the edge or edges of the groove may be made to effect the same purpose. The plug of the upper cock of a water gauge is made with a passage to admit steam to the glass tube, and the plug of the lower cock is made with a cross passage; when the lower plug is turned one-fourth round, the water out of the glass tube and the steam may be blown off, and when the plug is turned half round, the water alone is blown off through the ordinary passage; during the turning of the plug the sediment is loosened by the scraper and blown away by the water or steam.

[Printed, 10*d*. Drawing.]

A.D. 1862, June 20.—N° 1820.

ADAMSON, Daniel, and LEIGH, Levi.—This invention relates to steam boilers, it is also applicable to ship building, and consists in apparatus for drilling the rivet holes through both plates together instead of punching them separately, and also in forming flanges on the edges of metal plates. The drilling apparatus consists of a large circular base plate, hexangularly divided by six radiating lines, upon which six standards are disposed in a circle round a perpendicular column which rises from the centre of the plate. Mounted upon these standards are six adjustable horizontal drill head-stocks, and on the radial lines within the circle of the head-stocks are mounted six upright brackets, each of which carries a setting up screw on the same plane as the drills, which all point to the centre; superposed on four columns which rest upon the edge of the base plate is a circular frame, which carries the outer bearings of six horizontal shafts radiating from a centre, where on each there is a small bevel wheel, so fixed that all the shafts are simultaneously driven by one large bevel wheel on a vertical shaft connected with the

driving power; upon each horizontal shaft there is a strap pulley which corresponds with a pulley on each drill spindle, whereby the drills are set in motion. The shell of a cylindrical boiler is shown suspended from the upper part of the central column, within which there is a long screw, made to rotate by means of a horizontal shaft and mitre wheels below the base plate connected by bevel gearing to a hand wheel and standard conveniently placed; the nut of the screw, which raises and depresses the boiler shell, is within the column which has two longitudinal slots extending down each side from the top to about the mid-length; attached to the nut are two prongs, which project through the slots and carry an outside ring, and a swivel ring to which the suspending chains are fixed. The cylindrical shell is lowered between the drill points and the setting up screws, and adjusted between each operation of the drills, which act simultaneously on the annular seams. Flanges are formed on the edges of boiler plates by first heating and then passing them through suitably grooved rollers. In forming boilers of these plates their flanges are either bolted or rivetted together, and can be made to project either in or outside the boiler; an intermediate ring may be rivetted between the flanges. With regard to this part of the invention reference is made to the specification of a patent, granted to Daniel Adamson and Leonard Cooper, bearing date August 12, 1852, No 14,259.

Perforating those parts of feed water pipes which are within the boiler, and extending such pipes a considerable length through the water space, to effect an equal distribution of the feed water; by preference these perforated pipes are horizontally placed a few inches below the water level.

Flanged water tubes are placed on an incline across the flues to effect when necessary their easy removal.

[Printed, 1s. 4d. Drawings.]

A.D. 1862, June 21.—N° 1837.

REDSTONE, John Hooper.—(*Partly a communication from Albert Ellis Redstone.*)—This invention relates to "the construc-"tion of boilers of steam engines," consisting of two thick cast-iron plates which form the sides, and of two similar plates for the ends; these plates have within their solid metal, formed by cores, a series of hollow vertical channels arranged parallel with each

other; these channels open into longitudinal channels, also within the solid metal, along the top and bottom of each plate; the four plates when bolted together form a right-angled parallelogram, upon which a hollow cover, which carries a central steam dome, is mounted. The inside faces of the end plates are perforated with a quincunx arrangement of holes, to receive tubes which extend from end to end and open into the vertical channels of the end plates. All the longitudinal channels in the side and end plates communicate externally with each other and with the hollow cover, by means of short bent pipes, through which the water circulates and the steam rises to the cover and dome. The apparatus is placed over the furnace, so that the flaming gases and products of combustion may rise amongst the horizontal tubes and play round the side plates. A flue passage is formed through the hollow cover leading to the chimney. Movable plugs fitted in holes made through from the outside of the end plates, so as to correspond with the ends of the longitudinal tubes, are provided for the purpose of cleaning the tubes.

[Printed, 10*d*. Drawing.]

A.D. 1862, June 21.—N° 1839.

BOUSFIELD, George Tomlinson.—(*A communication from John Baird.*)—This invention relates to steam-engine slide valves, and consists in relieving the back of the valves from steam pressure by the use of a faced back plate, which rests upon inclined adjustable rods placed in longitudinal grooves sunk into the sides of the steam box, the projecting edges of the back plate being inclined to correspond with the side rods, so that when resting thereon the face of the plate is parallel to the valve seat; the slide valve is got up with true surfaces, back and face parallel with each other; it works between its seating and the under surface of the back plate, which is also a true surface, and can, by means of the side inclines and adjustable rods, be regulated to work in steam contact top and bottom, but without any objectionable amount of friction. When it is desirable to work a cut-off valve, it is placed upon the upper surface of the back plate. The whole of the centre of the slide valve is removed, in order to reduce rubbing surface; it has suitable induction ports in relation to those in the valve seat and the back plate, and the two latter have sunken equalizing recesses, corresponding in each with the area of the induction ports;

the ends of set screws through the steam-box cover abut upon the back plate and prevent its rising, and springs are inserted in the side grooves for the same purpose. The back plate fits between the ends of the steam box, and does not move with the valve.

[Printed, 8*d*. Drawing.]

A.D. 1862, June 24.—N° 1852.

DESGRANDSCHAMPS, THEOPHILE. — (*Provisional protection only.*)—This invention relates to a mode of working the slide valves of steam engines, whereby they are moved so rapidly at the commencement of a stroke, as to completely open the induction ports before the piston has performed any very material portion of its course. By this arrangement the full force of the steam is opened upon the piston concurrent with the beginning of each stroke, and acts immediately upon it with all its expansive force; also, at the end of the stroke, it as suddenly escapes into the exhaust passages without producing back pressure; the steam may also be cut off and worked expansively at any point, starting from one-fourth of the stroke. The excentrics and such like valve gear are not required, as the movement which works the valve, or distributing motion, is taken from a point in the connecting rod, the path of which describes an elongated ellipse. The slide valve, by means of a connecting rod, receives motion from a sector, which oscillates with the arms of " a T-shaped piece," which is actuated by the intermediate parts, and to which it is bolted; the movements of the slide valve are determined by the relative positions of the end of the connecting rod in regard to the centre or axis of the sector, which are regulated by a sliding block to which the connecting rod is attached.

[Printed, 4*d*. No Drawing.]

A.D. 1862, June 25.—N° 1859.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Frédéric Emile de Erlanger and Alexandre Friedmann.*—This invention relates to steam boiler and other furnaces. As applied to the fire-box of a locomotive boiler, it consists of a sheet-metal mantle or hood, which is fixed inside to the front of the furnace, enclosing the door and opening slopingly downwards towards the fire bed and back of the furnace, extending a considerable dis-

tance over the fire, so as to deflect the air current which enters through the door at the top of the hood, and distribute it over the burning surface of the fuel. The metal plate forming the hood is about ½ an inch thick at the crown, which is gradually increased lower down by laminating plates, to 1½ inch or more at bottom. The admission of air is regulated at the top of the hood through the door or otherwise, and as it passes down the inner surface of the hood, it becomes highly heated and rarified, and by mingling in that state with the gaseous and other products emitted by the burning fuel, produces additional heat and ensures their perfect combustion. During stoppages the air draught is kept up by a blower. In other boilers, when the furnace door opens on a level with the grate bars, a separate air passage is arranged to open into the top of the hood.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1862, June 28.—N° 1902.

PETRIE, JAMES.—(*Letters Patent void for want of Final Specification.*)—This invention relates to the slide valves of steam engines, and consists in forming the faces of such slide valves cylindrical, " so that they may be capable of turning upon centres " of motion, and this turning I effect by means of tappets or " other ordinary apparatus connected to a moving part of the " engine. In addition to this rotatory motion, the valves slide " as usual, but by the first-described arrangement the steam may " be cut off at any part of the stroke.

" The valves may constitute a portion or the whole of a cylin- " der, and in the latter case I avail myself of the back part " thereof for packing, whereby a portion of the steam pressure is " removed."

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 28.—N° 1903. (* *)

WEBSTER, JOHN.—(*Provisional protection only.*)—The title of this invention is " Improvements in the means of protecting steam " boilers from incrustation."

This invention consists " in causing the earthy and saline " matters which heretofore have been deposited on the boiler to " be precipitated by electric currents on another surface. One

" mode of carrying out the said invention is to set up an electric " action by the contact of two metallic surfaces; thus in an " ordinary steam boiler I place in contact with each other a sheet " of copper and a sheet of zinc (these I mention as the metals I " believe to be most suitable); these I immerse in the water in " the boiler, and I insulate them, as far as metallic contact is con- " cerned, from the boiler; it will then be found that all the earthy " and saline matters held in solution in the water will be deposited " on the said copper plate or plates, which can from time to time " be taken out of the boiler for the purpose of cleansing; the " entire interior surface of the boiler will thus be preserved " clean. In tubular boilers tubes of copper and zinc, placed in " contact and arranged so as to be readily removeable, may be " used as the means of collecting or throwing down the earthy " and saline matters. Or a chain or wire rope of zinc and copper " in contact can be made to travel round the surface of the boiler " or between the tubes. Other metals and substances may be " used in order to set up the requisite electric action, and the " forms and arrangements in which they are applied may be " varied."

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 1.—N° 1914.

PARKINSON, JOHN, and MARSLAND, JOHN.—(*Provisional protection only.*)—This invention relates to an apparatus for regulating the pressure and flow of steam and other fluids; it may also be employed as a reducing valve. A hollow piston open at one end is fitted to slide in a cylinder, which is secured in a casing furnished with inlet and outlet passages; the piston spindle passes out through the cylinder and casing, and is weighted according to the required difference between the incoming and outgoing steam or liquid; the sides of the cylinder and piston are perforated with holes, which correspond when the two are normally placed, but which vary according to the weighting of the spindle, whereby the steam passages are diminished in proportion to the required pressure. When used as a throttle valve, the spindle, which works through a stuffing box in the casing, is connected to and acted upon by the governor; and the piston, instead of being closed above, is left open.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 9.—N° 1980.

GREEN, THOMAS, and MATHERS, ROBERT.—This invention relates to the construction of steam boilers, superheating steam, and a regulating valve. The boiler is upright cylindrical, with a central furnace, which somewhat diminishes in diameter towards the top; the superheating chamber which forms the base of the chimney, is centrally placed on the top of the boiler; the ends of a group of vertical fire-tubes which pass through the upper water and steam spaces, form a communication between the superheating chamber and the top of the furnace, which is also furnished with a number of pipes so bent over into the form of narrow arches, that their flanged ends are brought to the same plane; a number of these bent pipes are rivetted to the top plate inside the furnace so as to hang down therein; these tubes communicate with the water space; the other portion of the bent tubes are rivetted upon the furnace, they rise into the water and are open to the fire; sometimes the bent tubes are fixed to the sides of the furnace. A volute spiral coil of pipe through which the steam passes to the engine, is so placed on the superheating chamber that the burning products of combustion, as they rise from the furnace up the vertical tubes, shall play in succession upon each lessening convolution of the spiral coil. The regulating valve is contained in a valve box, in which, rising inside from the centre, there is a short tube furnished with side openings but closed at the top; this tube opens downwards through a short flanged pipe by which it is attached to the boiler or steam chest; the valve in the form of an inverted cap, is fitted to slide up and down upon the short tube, above which steam is admitted into the crown of the valve; the valve spindle, which rises out of the valve box through a stuffing box, is jointed to a lever by which it is operated; an outlet pipe in the side of the box conducts the steam to its use; the steam enters the valve box through a tube by the side openings, which are more or less closed by the oversliding cap valve. Instead of sliding, the valve may be made to open and close by a rotary movement.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1862, July 10.—N° 1989. (* *)

BIDDLE, EDWARD JOHN.—(*Provisional protection only.*)—Improvements in furnaces for burning petroleum or coal oil as fuel.

"The furnace, which may be of any suitable size and shape, is "constructed of ordinary materials. Instead of the grate or bars "now used the bed of the furnace is constructed solid to prevent "the escape of the fluid. This bed may be made either smooth "or corrugated. The draught is obtained through a grating in "the side or end of the furnace, which admits the air but con-"fines the flames, and an additional supply of air comes to the "flames through pipes terminating within the walls of the fur-"nace. The oil enters the furnace at the bottom, and is at first "ignited by surrounding the mouth of the pipe through which "it passes with a small quantity of burning coals."

"Tanks for holding the oil are provided, with pipes which "permit the escape of the explosive gases, and render the use of "this oil perfectly safe."

The fuel when used on board steam ships possesses the great advantage of economizing space.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 11.—N° 1995.

HILL, John Reed.—(*Provisional protection only*.)—This invention relates to a mode of fixing and working an engine governor in steam vessels.

"To the under side of the deck in the engine room I fix a suit-"able frame, from which I suspend a common two-ball governor "on pivots, so that it hangs freely, always remaining in a vertical "position, uninfluenced by the varying position of the vessel. "On the top of the governor spindle there is a universal joint "fixed, connecting it with another spindle, the upper end of which "works in a bearing fixed to the ship. This latter spindle will "be in a permanent position as regards the ship, and receives "motion for driving the governor at the upper end. Both these "spindles are hollow, the lower one containing a rod, with flexible "joints at the top, for transmitting motion from the balls to the "lever of the throttle valve."

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 11.—N° 2001.

BLISS, William.—(*A communication from David Wilkinson.*)—This invention relates to heating ores and generating steam; it consists in employing a steam boiler in connection with a calcining

furnace, wherein, forming the bridge across the end of the boiler furnace, is placed a retort containing charcoal, through which a constant current of steam is passing from the boiler to the bottom of the calcining furnace, whereinto it is admitted through suitable passages. The air used for the blast in a heated state is impelled through a system of heating pipes suitably disposed in the combustion chamber or boiler flues, a fan or other suitable blowing apparatus being used for the purpose. The quartz or ore, together with the fuel, is filled into the furnace, and the air and decomposed steam is admitted at the bottom; the combustion of the two combined produces intense heat; after the lapse of a regulated time the air supply is stopped off, and the process finished with the gas alone. When used to generate steam for driving steam engines, those parts in the boiler in connection with the calcining process should be protected by fire-clay or brickwork.

[Printed, 8*d*. Drawing.]

A.D. 1862, July 16.—N° 2042. (* *)

DUNN, Robert.—Improvements in boiler furnaces.

"It is proposed to make the fire-bars tubular, and to construct " them in two or more lengths, the tube of any one length being " fitted so as to correspond with the tube of the contiguous length " or lengths, with the view of forming a continuous passage for " air from the front of the furnace to the bridge. The length " next the bridge fits into a metal frame or chamber upon which " the bridge when used is placed. Through and at the back of " this frame or chamber are one or more orifices by which the air " passing through the tubular bars makes its egress and then " mingles with the gases evolved from the fuel."

"Another part of the invention consists in forming openings " on the under sides of the tubular fire-bars so as to admit air " thereinto."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, July 19.—N° 2058.

BROWN, Andrew Betts.—This invention relates to slide, valves of steam engines and heating feed water in boilers; it consists (1) in the use of a subsidiary slide valve, made to work on the back of the primary valve, which has two ports cut through flanges; the sub-valve has also two ports in its flanges, one of

which always coincides with one in the primary valve at the extremity of its stroke, whilst the other port is closed; the primary valve is worked in the usual way by an excentric rod and valve spindle; the sub-valve is also worked by a spindle, upon which is mounted a friction sliding joint, driven by a slot link suspended from a fixed centre; the slot link is actuated by a connecting rod from the primary valve spindle joint. The speed, or the extent of the travel assigned to the sub-valve, varies with the position of the working block in the slot link, and as when it is effecting a short "cut off" or any degree of expansion it must have a longer traverse than the primary valve, the friction sliding joint, after having closed the primary valve port, moves freely on the spindle. By these means steam is worked with any degree of expansion, by varying the traverse of the subsidiary valve.

2. Heating feed water by constructing for that purpose annular water spaces round the smoke boxes or chambers of horizontal or locomotive boilers, through which the feed water is forced on its passage to the boiler; arrangements are made for passing the feed water pipes leading to and from the annular heating chamber, through stuffing boxes in the smoke box door.

[Printed, 10*d*. Drawings.]

A.D. 1862, July 19.—N° 2060. (* *)

BARRETT, Robert.—"Improvements in apparatus for working "the damper of steam engine furnaces."

"My invention is for improvements upon an invention for "which Letters Patent were granted to Philip Marcus, dated the "14th March 1856, No. 618, and consists in the employment of "a double or compound lever, to the long arm of which the rod "or attachment to the damper is connected in lieu of the simple "lever described in the Specification of the said Letters Patent.

"My invention further consists in placing the frame in which "the bearings for the spindle of the damper are formed at an "angle, and in bringing the base of the slot in which the spindle "works into a horizontal plane or nearly so. And in order to "render the working of the damper as easy as may be, I bring "the bearing or edge of the slots on which the spindle works, or "the spindle itself, to a knife edge."

[Printed 10*d*. Drawing.]

A.D. 1862, July 22.—N° 2077.

MERITON, THOMAS.—This invention in regard to steam engine governors and machinery speed regulators, relates to that description known as the fly-wheel governors, which depend for their action on differential velocities; it consists in removing superfluous details and in simplifying and rendering the mechanism more effective. A short shaft is mounted in bracket bearings; this shaft is tubulated or socketed from one end through a considerable portion of its length; it has two coarse pitched helical slots cut through that portion of its length which extends between the brackets; a short solid spindle, which near one end has a transverse hole drilled through its centre, is fitted to slide and partly revolve in the tubular part of the short shaft; the other end is furnished with two collars which form between them a recess, wherein are placed the prongs of a forked lever, which operates the throttle valve as the spindle moves in and out of the socketed shaft. When the spindle is in its place, the hole through it corresponds with the helical slots in the shaft, and with two holes in a ring which is fitted to slide lengthwise upon it; a pin, free to slide in the slots, is driven through the holes and left fair at each end with the outside of the ring. A fly wheel with a long boss, which together fill the space between the brackets, is mounted on the shaft; the boss is chambered through the principal portion of its length, to form space for the longitudinal sliding action of the ring. It has also two spirally slotted guides or double action inclines, through which, on opposite sides, two studs are entered, and screwed into holes made in the ring to receive them; a driving pulley is fixed outside the bracket upon the solid end of the shaft, which is driven by the engine. When a portion of the load is removed, the engine will move at a corresponding acceleration of speed and consequently the tubulated shaft also, but the fly wheel hangs back, and while it is being brought up to a corresponding speed, the studs and spiral inclines so act upon the ring as to cause it to slide, and, by means of the transverse pin, protrude the spindle and close the valve: in the meantime the speed of the fly wheel having increased and that of the engine fallen off, the inclines are operating the ring in the contrary direction, and without the aid of reacting springs or weights, the engine is again brought up to its ordinary working speed.

[Printed, 8*d*. Drawing.]

A.D. 1862, July 23.—N° 2094.

COLBURN, Zerah.—(*Provisional protection only.*)—This invention relates to condensing apparatus for steam engines, and consists in dispensing with the air pump, and disposing the condenser so as to have a clear fall of not less than 30 feet, in order that the water of condensation and the water injected may run off through a pipe, the end of which extends below the surface of the pool, whereby the admission of air to the condenser is prevented. When a 30 feet fall is not obtainable, a centrifugal force pump is used to remove the water from the condenser. The substitute for the air pump consists of a closed vessel or hydraulic exhauster superposed above the condenser; to the lower part of this vessel is fixed an outflow pipe and delivery valve, which opens into the condenser and terminates therein with an injection nozzle; another smaller pipe and valve for the passage of air, forms a communication between the upper part of the condenser and the top of the vessel, to which is also attached an inlet water pipe and valve and an air delivery valve. The valves are of simple construction suitable for regulating the flow of liquids, and with the exception of the self-acting air delivery valve, are actuated at corresponding intervals in any convenient manner by the engine. The vessel being filled with cold water and the supply shut off, by the opening of the valve the water immediately flows through the outflow pipe into the condenser, and as its level sinks in the vessel, air from the condenser through the air pipe supplies its place; as soon as the vessel is empty, the communications with the condenser are closed, and the inlet water supply again opens to refill the vessel, during which process the air contained raises the valve, and escapes; and so on, the succeeding operations being repeated every revolution of the engine.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 23.—N° 2095.

DUTTON, Edward Kenworthy. — (*Provisional protection only.*)—This invention relates to the slide and other valves, and steam passages of engine cylinders, consisting :—

1. In admitting the steam to the interior of the valve through a port in the valve seating, corresponding in position with the ordinary exhaust port, while the exhaust steam passes into the valve box ; the valve is of the ordinary form, and is kept down

on its seat by means of a back plate, which may have a port through its centre, and by sustaining the pressure of the steam, constitute an equilibrium valve.

2. Consists in saving that portion of the steam usually lost in the passages between the ends of the cylinder and the valve; this is effected by making the valve sufficiently long to discharge the steam into ports formed at each end of the cylinder, steam being admitted to the valve through ports in the seating, and thence through channels in the valve to the induction ports, said channels being closed by a back plate, between which and its seating the valve slides. The cylinder may exhaust into the steam chest, or the steam may pass off under the valve through suitable passages in the seating, in which case the valve may be inspected during the working of the engine.

3. Consists in a mode of cutting off the steam from the cylinder at any point in the stroke, which is then finished by the expansive force of the steam. For this purpose, cylindrical passages are formed in the valve in which cylinder valves are fitted to slide, by means of a rod working independently through the slide valve rod, which is tubulated for the purpose. Various plans are suggested for operating the valves; the amount of expansion may be regulated and indicated during the working of the engine.

4. Relates to a novel construction of steam regulating or diminishing valve. In a cylinder furnished with inlet and outlet passages, two hollow cylinders are fitted to slide easily; these are connected to pistons fitted in such manner into the cylinder covers "that each inner cylinder moves in unison with the piston farthest "from itself, the steam being admitted between the inner ends "of the cylinders, and passing through them in contrary directions to the exit passages acting on the pistons to close the "valve, a weight equivalent to the pressure of steam required "being applied to the outer ends of the pistons, and tending to "open the valve, the action of the two forces effecting the reduction of the pressure of the steam, as is well understood."

[Printed, 4*d*. No Drawings.

A.D. 1862, July 24.—N° 2100.

LEETCH, JAMES, and MATHEW, BROWNLOW. — This invention relates to a mode of protecting the surfaces of metal plates or other articles from oxidation, incrustation, and all adherent matter,

especially as regards ships' bottoms, steam boilers, and machinery, by means of a glaze or vitreous compound, or by sheets of glass.

1. As applied to iron plates. The plate is first subjected to the action of diluted acid and cleansed by scouring; "it is then placed " in a furnace or otherwise heated to, say, a dull red heat. If in " the state of plates or other suitable form the iron is dipped in a " bath of or is coated with soluble glass, a silicate of potash or " soda, or of both potash and soda; any soluble glass may be " used, but we prefer that which is less basic in character. The " plate is then returned to the furnace, where it is exposed to " such heat as will not injuriously affect it, but will cause the " materials surface to vitrify and form a thin coating of glass " (now become a double or more complex silicate) and to closely " adhere to or even to impregnate the metal. This dipping or " coating and exposure in the furnace may be repeated as often " as may be thought necessary. In some cases we apply the heat " by means of a blow pipe or blast furnace, or otherwise, and pay " the soluble glass over the heated surface and again apply heat " to cause vitrification, as before." The vitreous coating can be hardened by adding silica, lime, alumina, baryta, talc, manganese, or other materials ordinarily used in the manufacture of glass or enamels, and, if colour be desired, by adding ochre, cobalt, or other colouring matter. The modes of application vary according to the object of its use and the conditions under which it is necessary to apply it.

2. Consists in fixing glass plates or sheets upon metal surfaces, coated with a soft cementing medium or bed composed of gutta percha, coal tar, and resin, or of other suitable ingredients. The glass sheets are first bent to the form of the metal surface, and both are perforated with holes to coincide. The cement is applied in a heated state to either the glass or the metal plate, which are afterwards carefully bolted or screwed together by bolts or screws, the heads of which have been previously protected with a coating of glaze.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 25.—Nº 2117.

MANZINI, Vincenzo. — (*Provisional protection only.*) — This invention relates (1) to the construction of locomotive engines, and consists in the employment of only one cylinder, which is

fixed to the side framings between the driving wheels. It is proposed "to employ a rotary piston and to fix driving cranks "upon opposite ends of a shaft, to which said piston is fixed, "said cranks to be connected each to a rod for coupling the "wheels together and imparting rotatory motion direct thereto as "the piston rotates." The invention also consists in adapting across the outer face of locomotive wheels, bars of metal capable of sliding so as to bring their ends successively in contact, by means of a curved piece of metal attached to the framing, with an auxiliary wooden or iron rail fixed at a short distance outside the permanent rails along those parts of the line of railway which incline or gradiate from the level, for the purpose of assisting the holding powers of the driving wheels whilst ascending, and of retarding and regulating the motion of the engine during its descent.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 30.—N° 2159.

HYDE, Joseph, and HYDE, Jessia.—(*Provisional protection only.*)—This invention, relating to governors for steam engines, water wheels, mills, and similar purposes, "is designed for the "purpose of insuring the slightest alteration of the governor "being transferred to the steam supply valve, and thus to render "the governor more positive and sensitive in its action, and "prevent inaccuracy from the adhesion or friction of any "part.

"The improvement consists in the application and use of a "train of gearing interposed between the governor and the steam "valve for the above purpose. Upon the vertical shaft driving "the governor a pinion is fixed gearing with another pinion "which drives a shaft actuating bevil gearing and a double "catch box, which is connected and disconnected by the move- "ment of the ordinary lever acted upon by the 'governor;' these "upper and lower catches being thrown in and out of gear regu- "lates the admission of the steam by opening or closing the steam "supply valve."

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 2.—N° 2188.

ONION, Thomas.—This invention relates to rotary steam [engin]es and screw propellers; it is, so far as regards the engine,

supplementary to the Specification of Letters Patent granted to this inventor, bearing date January 21, 1847, N° 11,539, wherein is described a rotary engine. In the present Specification the inventor states, that by the use only of two piston plates the pressure upon the rotating parts is unequal; he, therefore, according to the present invention, describes four piston plates, and instead of one, two fixed abutments, with a corresponding number of steam inlet and outlet passages.

The engine consists of a fixed cylindrical case, closed at both ends, wherein, concentrically fixed upon a central axis, is a revolving drum which abuts against the ends of the case, and is so much smaller in diameter that an annular space is formed between its periphery and the case, wherefrom, diametrically converging from opposite sides, are the two fixed abutments, which are furnished along their edges with suitable packings to press with frictional steam-tight contact on the drum, into which from end to end are sunk, diametrically at right angles with each other, four longitudinal mortice grooves, wherein the piston plates, as the drum revolves, radially slide towards the axis, as in succession they approach the fixed abutments, instantly diverging again the moment the abutments are passed. This movement is imparted to the piston plates by corresponding eccentric grooves sunk in the ends of the case, which form circuitous paths for rollers which revolve upon studs fixed in the ends of the piston plates. The ports for admitting and exhausting the steam open respectively into the annular spaces at the sides of the fixed abutments, and a valve is arranged for stopping and reversing.

The propeller is an ordinary screw with two blades, the extreme ends of which are flanged for the purpose of checking any lateral inclination of the water when pressed upon by the revolving blades.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1862, August 8.—N° 2226.

HUMPHRYS, EDWARD.—This invention relates to that description of steam engine in which two cylinders of different diameters are employed to work conjointly. The smaller cylinder is fitted to the bottom of the larger cylinder, wherein the steam which is supplied by the exhaust steam from the small cylinder works expansively. A trunk is attached to the piston of the large cylin-

der and works through a stuffing box in the cover. The piston rod of the small cylinder works through a stuffing box in the bottom of the large cylinder, passes through the large piston, and is secured inside the bottom of the trunk, where also the connecting rod is jointed. Both cylinders are double or encased to form steam spaces and prevent condensation. One end of the frame which carries one of the crank shaft bearings, is bolted to the cylinder cover; the other bearing may be supported in any convenient manner. It is preferred that the stuffing box between the cylinders be stuffed with a metallic packing. The valves and other parts of the engine may be of the ordinary construction.

[Printed, 10*d*. Drawing.]

A.D. 1862, August 11.—N° 2240. (* *)

GOODFELLOW, Jacob.—(*Provisional protection only.*)—" Im-" provements in steam or water engines."

"Instead of a stationary lap at each side of the valve, I employ " moveable laps connected together, but capable of being adjusted " to any required distance apart. . . The aforesaid laps are moved " to and fro so as to form an aperture to the port, and cut off " at any portion of the stroke either by the movement of the slide " itself, or by means of a screw, cam, or other contrivance. I " also employ moveable laps to surface valves in general, so that " by moving the laps less power is required to work the valve."

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 12.—N° 2251.

MACNAB, William.—(*Letters Patent void for want of Final Specification.*)—This invention relates to various internal and other arrangements in connection with the construction of high and low pressure steam boilers. A cylindrical boiler is constructed with one or two large furnace tubes which open to a combustion chamber at the back, whence the burning gases pass through a system of tubes into a smoke-box in front, and then again return through two or more comparatively large tubes which extend horizontally through the steam space in the boiler. The furnace mouths project level with the smoke-box, and are encased with water space. Two or more of such boilers may be arranged side by side or end to end in communication with a central funnel, and an additional steam receiverwith a superheating flue may be longitudinally disposed over

the division of each pair. In tubular boilers the tubes are placed in horizontal tiers, which are connected alternately together at the ends so as to form continuous channels. By means of a pump an upward flow of water is kept in constant circulation within the tubes. In some boilers the tiers of tubes are divided into three or more distinct sets, supplied by different pumps, each set acting independent of the others. The feed water may pass through some of the upper tiers prior to its general introduction. Other subordinate arrangements are described, including an arrangement of side flues wherein the feed water pipes are disposed, and an apparatus for feeding boilers, which consists, according to one modification, of a steam cylinder acting directly on the pump rod. When necessary the motion is reversed by means of a tumbler movement in connection with the valves, which acts upon them suddenly at each end of the stroke.

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 12.—N° 2257.

DELRUE, Alexander.—This invention relates to the preparation and use of liquid vegetable compounds for preventing and removing incrustation in boilers. "The compositions are com-
" posed entirely of vegetable matters, and are prepared by dis-
" solving or infusing in hot water the bark of the oak and pine
" as well as the leaves of the sumac tree ground and reduced to
" the state of a coarse powder. This decoction is concentrated to
" a density of about 10° Beaumé, and to it is added a quantity
" (say from 15 to 30 per cent.) of cream of tartar (bitartrate of
" potassa) and spirit of turpentine. In employing this liquid to
" prevent incrustation in steam boilers, a quantity of it is intro-
" duced from time to time into the steam boilers; the quantity
" of the liquid required varies according to the capacity of the
" boiler, three pints of the liquid being generally sufficient for
" every thousand pints of water in the boiler to prevent incrusta-
" tion forming for about ten days."

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 13.—N° 2268.

SMITH, John, and Rayment, John Saunders.—(*Provisional protection only*.)—This invention relates to apparatus for, gene-

rating and regulating the flow of steam, and other purposes. It consists in the use of revolving triangular furnace bars, serrated or notched on each edge or angle, and so ranged side by side that the projections between the notches on each alternate bar, shall, when the bars are rotating, coincide with the notches in the intermediate bars, whereby clinkering is prevented or broken up, and a clear fire maintained; the waste steam is made to assist the air draught through the bars, and the products of combustion are directed between feed water heating chambers disposed in the draught passages. The blow-off is effected without noise, by conducting the exhaust steam into a closed chamber, out of which it issues in continuous jets through a series of orifices into pipes placed in the smoke chamber. The regulating tap or cock consists of a conical plug opening to the outlet pipe; it is placed in a suitable barrel which is in communication with the inlet pipe; lateral passages through the plug coincide more or less (according to position) with the inlet passages in the barrel. The plug spindle passes through a suitable stuffing box.

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 18.—N° 2317.

BRIÈRE, JULIAN. — This invention relates to an automatic apparatus for feeding steam boilers. " Between the boiler and the " water tank a rock shaft is situate carrying a pair of hollow " cylindrical valves. The lateral passages of one of these valves " communicate respectively with a water supply pipe leading " from the water tank and a water supply pipe leading to the " boiler, and those of the other valve connect the steam pipes " which lead respectively from the boiler to the water tank. " The rock shaft and valves are operated by means of a rock " lever of which the shaft is the fulcrum. This lever carries at " one end a weight, and at the other a steam-tight chamber. " Into this chamber project to near the upper end thereof pipes " which are connected to the central bore of the cylindrical valves, " the object being to supply this chamber alternately with water " and steam, and thus to cause it to fall when overbalancing the " weight, and to rise when of less gravity. Steam is supplied " from the boiler by a steam pipe (dipping down to the permanent " water level line) to the rocking chamber, and as it condenses " therein a partial vacuum is formed which is filled by water from

" the supply tank. As this accumulates the chamber falls and " through its rock lever shifts the position of the valves. The " chamber being now lightened will rise and the valves will be " shifted again allowing a fresh supply of water to enter the " chamber, and opening a way for the steam to escape therefrom " into the water supply tank when the supply water is required " to be heated. To facilitate the latter operation the water may " be discharged on to trays in the tank and fall in thin streams " from one to the other, the steam let into the tank passing up " and mingling therewith."

[Printed, 10*d*. Drawing.]

A.D. 1862, August 19.—N° 2321. (* *)

CLEUET, Victorin Florentin.—" An improved self-acting " apparatus for supplying boilers with water, applicable also to " the raising and to the measuring of liquids."

" My apparatus consists of a hollow vessel or float immersed in " liquid contained in another vessel or case, which float in alter- " nately filling and emptying becomes in turn heavier or lighter " than the liquid which surrounds it, and partakes of itself of " alternative vertical motion, whereby it is placed in successive " communication with the boiler and the feed supply, to transfer " from one to the other the water necessary for the generation of " steam."

The raising of liquids is effected by the vacuum produced in the apparatus, and liquids may be measured by the ascent and descent of the float.

[Printed, 10*d*. Drawings.]

A.D. 1862, August 19.—N° 2324.

HOYLE, William Jennings, and PROVEN, John.—This invention relates to a mode of supplying lubricating matters to the cylinders of steam engines, and to the bearings and frictional surfaces of mechanism, and consists of (1), by means of a pump, injecting the lubricant on each side the piston simultaneously with the entry of the steam as often as may be required. The apparatus is worked by a reciprocating weighted lever, which is raised by a chain each stroke of the engine and falls by its own weight; the end of this lever works loose upon the end of a fixed spindle, whereon a ratchet wheel is advanced intermittently every up

stroke of the lever, by means of a pawl attached thereto; on the axis of the ratchet wheel there is a pinion, gearing into a small spur wheel which is fixed upon, and actuates a spindle, whereon there is a fixed revolving disc which has a part of its periphery removed and a segmental tumbler arrangement at the side. The lubricant is contained in an open cistern, wherein a small vertical pump is fixed; the pump plunger has a transverse slot to receive the free end of a small weighted lever, which passes through it, and enters at its extreme end a curved link fixed to the reciprocating lever. Although the reciprocating lever is always in motion, and by means of the ratchet the disc continues to revolve, no action of the pump takes place until a stud, which projects from the side of the weighted end of the small lever and sustains it by resting on the disc, sinks when the cavity in its periphery comes round; the pump plunger is then raised by the other end of the small lever, which is again pressed down by the end of the link on the reciprocating lever the next time it descends, and, by its weight overcoming the small lever weight, forces the lubricant through a suitable valve and tubule into the steam pipes leading to the cylinder. The length of stroke may be regulated and the apparatus when required be worked by hand. 2. Describes modifications of the apparatus, and arrangements for lubricating a series of journals and mechanical surfaces and working parts, from one cistern.

[Printed, 8*d*. Drawing.]

A.D. 1862, August 21.—N° 2337.

DAVIES, George.—(*A communication from Caldwell Colberson Jenkins and Frederick Jumelle.*) — This invention relating to governors for steam engines, consists in adapting a bow spring to the governor spindle, and connecting the ends of the spring, by jointed rods, to lugs upon the opposite sides of the upper part of the sleeve; in other respects, the governor is fitted up in the ordinary manner with balls attached to the ends of lever rods which are jointed to the vertex of the spindle, the two jointed side rods connecting the balls with the sliding sleeve, which is grooved to receive the forked lever, communicating with the throttle or other valve; the increasing resistance of the bow spring upon the sleeve in the act of rising is counteracted by the changing position or angle of the connecting rods, in relation to the vertical path of

the sleeve up the spindle; when the governor is at rest and the sleeve at the bottom of its action, this angle is very obtuse, but as the sleeve rises it gradually approaches a right angle, and therefore the connecting rod acts with increasing power against the spring (on the well known principle of the knee joint) and so balances its increasing resistance.

[Printed, 6*d*. Drawing.]

A.D. 1862, August 21.—N° 2338.

CLEMENTS, Thomas, LLEWELLIN, Peter, LLEWELLIN, John, and JAMES, John Wanklyn.—This invention of a self-acting lubricating apparatus, consists of a steam-tight vessel for holding oil, tallow, or other lubricant, to which is fitted a glass tube or gauge through which the height of the contents of the vessel may be seen; a funnel provided with a valve for charging the vessel is mounted thereon, and also a vent cock for the escape of air while the vessel is being replenished; another cock opens at the bottom of the vessel to discharge foul tallow or the water of condensed steam. The apparatus is attached to the main steam pipe; steam is admitted above the lubricant in the vessel through a connecting tube and regulating cock, and by the steam pressure the lubricant is driven through a pipe to the slide valves, pistons, piston rods, and other working parts of the engine; this latter pipe is fitted with a regulatlng cock, which shows upon a graduated index, by means of an indicating finger mounted on the plug handle, the area of the open passage, wherefrom may be estimated the quantity of lubricant being supplied.

[Printed, 10*d*. Drawing.]

A.D. 1862, August 22.—N° 2353.

WOOD, Thomas.—(*Provisional protection only.*)—This invention relates to reducing the friction between the faces of slide valves and their seatings, by sustaining the valve against the steam pressure, for which purpose an elastic diaphragm of thin metal or india-rubber is formed over the exhaust cavity of the valve, supported by a plate placed underneath which rests upon anti-friction rollers arranged to run on a prepared pathway made across the exhaust port; or the supporting plate is connected to the segment of a pulley, the curved arc of which rests upon a

prepared surface in the exhaust port. When (as in the case of outside cylinder locomotive engines, where two valves work back to back) the elastic diaphragms are connected by a rod, their elasticity yielding to the movements of the valves, so that the pressure upon the diaphragm of one is balanced by the counter-pressure of the other. When the elastic diaphragm is connected to a plate exterior to the valve, the plate is made to run on rollers which are arranged to traverse pathways formed in the sides of the valve box.

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 28.—N° 2391.

HUSBAND, William.—This invention relates to water valves, to be used in connection with steam pumping and forcing engines for the purpose of admitting water into pumps and vessels, or steam into engine cylinders or otherwise, the object being to obtain greater water or steam way in proportion to lift, and consequently, diminish the shock both in closing and opening the valve; the weight will also be diminished. "On the seat of "the valve box or nozzle is to be bolted an annular iron bed "plate, having eight or other number of arms, or supports "extending obliquely upwards and inwards therefrom, for the "purpose of sustaining an uppermost and an intermediate similar "annular bed plate of the same diameter, or decreasing in diameter, "according as the vertical section of the supporting arms to this "point is parallel or decreasing in diameter. The bottom and "top bed plates are each furnished with a ring of composition "metal, wood, india-rubber, or other material, let into a channel "cut round their surfaces, the surface of the rings being slightly "raised above that of the plates. The central or intermediate "annular plate has two of these gun metal or other rings let "into its surface; namely, one at the upper and the other at the "lower part thereof. There will thus be four rings of metal or "other material in the seat, each of which serves for the bearing "surface of corresponding rings of iron, which are formed by the "lower surfaces of two dome-shaped caps or covers connected "together by eight or other number of arms. The uppermost "bed plate supports vertical gun metal bearings for the inner "circumference of the upper dome, and to the lower part of the "arms of the bed plate similar bearings are bolted in order that "the connecting domes may be kept in a level or horizontal

" position during their rise and fall. The moveable portion of the " valve is prevented from rising beyond a necessary height by " means of a projecting flange at the top of the upper bearing " surface, and a ring of vulcanized india-rubber or other " material under the flange will obviate any shock or jar to the " valve caused by the alternate ascent of the domes."

[Printed, 8*d*. Drawing.]

A.D. 1862, August 30.—N° 2408. (* *)

LE CONTE, Felix.—Improvements in steam boiler and other furnaces, consisting in " the construction of fire or furnace bars " presenting an angle above and below, or with a plane surface " at top, but pierced with openings through which pass currents " of air in opposite directions, by which means a mixture of air " and carbonated gas takes place within the focus of the fire-place " and quickens combustion."

[Printed, 8*d*. Drawing.]

A.D. 1862, September 2.—N° 2428.

GLANVILLE, Richard.—This invention relates to marine and other steam engines, constructed for the purpose of economizing fuel and space, and designated an " annular expansive condensing " steam engine." It consists of a concentric series of cylinders, each cylinder of such diminishing diameter in relation to the others, that when placed in circumposition one within another, a series of intermediate concentric annular spaces are formed, in which a concentric series of annular pistons act simultaneously, all the piston rods being connected to one piston block orcross head which operates on one crank. Steam at high pressure is supplied to the central cylinder, which exhausts into the second, and the second into the third, and so on until the expansive power of the steam is exhausted. One top and one bottom cover are common to all. The steam valves, ports, and passages are suitably timed and arranged to conduct the steam in succession from the first or central cylinder to the largest, the valves being actuated by an excentric, through a lever and valve rods. An engine comprising a central and only one circumposed cylinder is described and illustrated, but the invention is not confined to any limited number.

[Printed, 1*s*. Drawings.]

A.D. 1862, September 2.—N° 2429.

WAYGOOD, Richard.—(*Provisional protection only.*)—This invention relates to steam boilers, and "consists in constructing "boilers in which vertical tubes, by preference tapering towards "their upper ends, lead the products of combustion directly upon "the bottom of a water space extending nearly across the boiler. "The products of combustion are caused to ascend over the "upper part of the water space, and in doing so impinge against "tubular water spaces. The products of combustion from each "side of the transverse water space meet, and, if required, are "made to pass upwards through other vertical tubes, impinge "against the bottom of another transverse water space, and so "on, as before, according to the height of the boiler."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 2.—N° 2430. (* *)

ROBERTS, William.—(*Provisional protection only.*)—"Improvements in apparatus for regulating the amount of water "discharged by a pump, chiefly applicable for regulating the "amount of water thrown by a steam fire-engine, or for regulating "the amount of water fed to a steam boiler."

"I (in the case of double-acting pumps) make a passage between "the two extremities of the pump cylinder, in this passage a valve "is placed, by which the passage can be entirely closed. When "the pump is required to throw as large a jet as possible, the "valve is closed, but when a small jet is required, the valve is "partly opened, a portion only of the water forced by the piston "from one end of the cylinder will then pass away through the "jet, the remainder passing through the passage, and entering "the cylinder at its opposite end, so that a less quantity of "water will be drawn into the cylinder through the suction "pipe."

"Apparatus such as above described may be applied to the feed "pumps of steam boilers."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 8.—N° 2468.

WILLIAMS, Charles Wye.—This invention consists in increasing the flat heating surfaces in steam boilers, by an arrangement of tube plates placed transversely in a line a short

distance apart within the boiler; every other space between these tube plates is occupied by a group of short tubes, the ends of which are fixed in the plates, and the intermediate spaces are enclosed by narrow plates, which are bolted or rivetted round the tube plates, and so form separate circular heating chambers, through the whole of which, by means of the short intermediate connecting tubes, there is a free passage for the products of combustion, and by which the flat heating surface capacity of the boiler is considerably increased. In some cases the short connecting tubes are made coniform, and by other arrangements, instead of using round tubes, the communications between the heating chambers are made through flat tubes or passages. Sometimes, and particularly in short boilers, the tubes or passages are so arranged to open into the chambers, that the flaming gases shall strike the intermediate surface of the opposite tube plate, and not be allowed to enter the succeeding group of tubes in a direct course.

[Printed, 1*s*. Drawings.]

A.D. 1862, September 9.—N° 2477.

WEBSTER, John.—(*Provisional protection only.*)—This invention for preventing incrustation in steam boilers, consists in placing therein a surface of tow, hemp, jute, cotton waste, or other fibrous and absorbent material, wherein the residue of evaporation is deposited. To every 8 tons of water contained in the boiler, 2 lbs. (by preference) of tow is introduced therein, extended on wire gauze or other netting; when fully charged with residual matters, the absorbent material is to be removed and replaced with a similar quantity of fresh material forming a new surface. "Various materials of the nature here described with "mechanical arrangements, and the quantity of fibrous and "absorbent substance suitable to the water, size, shape, and use "of the boiler may be employed."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 9.—N° 2480.

SELBY, Fraser.—This invention relates to traction engines in respect to the driving gear and axle, the arrangement of cylinders, the piston rods and cranks, and, as regards the valves, to compound steam engines, stationary or otherwise. To prevent constant

jolting and vibration, the axle of the driving wheels of traction engines is formed in three parts connected together by "Hook's" or other suitable joint; the middle, which is the shortest length, carries the spur wheel; it is supported by brackets fixed under the boiler, and revolves in the same position irrespective of the up and down vibrations and joltings of the wheels. The two cylinders are placed side by side under the smoke box; the crank shaft, which is very short, is also supported by the brackets under the boiler. The cylinders may be placed in any other convenient position, and the pistons and rods be connected to one or separate cranks. The arrangements for valves are shown and described in connection with a compound stationary engine, consisting in one plan, of a high-pressure cylinder concentrically placed inside a low-pressure cylinder, and on another plan, disposed side by side. There are three separate valves and valve boxes; the first regulates the admission and emission of the high-pressure steam to the central cylinder; this valve seating has four ports, two leading respectively to the ends of the high-pressure cylinder, and two respectively to the other two steam boxes, which regulate the admission and emission of steam to the low-pressure cylinder; each of these two steam boxes contains an ordinary slide valve; one rod may work both valves when placed in a line, passing through a stuffing box in the partition between the valve boxes; one port in each box communicates respectively with the separate ends of the cylinder, and the other ports with the exhaust or with the condenser. Another arrangement consists in working two slide valves in the same steam chest, one valve on the back of the other; the valve seating is pierced with five ports, two of which work the piston in the high-pressure cylinder, two the piston in the low-pressure cylinder, the fifth port being the passage for the exhaust. "The slide valve working over these five ports is constructed "with two arches to it, and from each arch is a port passing right "through to the back of the valve, and between these two arches "there is another port also passing right through to the back "of the valve. The other or second slide valve above referred "to works over these three ports on the back of the first valve, "and thus prevents the steam in the chest entering any of them. "This second valve is similar to an ordinary slide valve with "one arch, and is so worked that it opens the exhaust at the "*proper moment* before the slide valve next the ports on the

" cylinder is able to do so, but which afterwards also opens the " exhaust." The cylinders may be steam jacketed.

[Printed, 2s. Drawings.]

A.D. 1862, September 10.—N° 2490.

BARCLAY, Andrew.—(*Provisional protection only.*)—This invention relates to traction engines of the "right angled class," and to apparatus for indicating steam pressure. It consists in an arrangement of the bearings of the crank shafts, in order to prevent the vibrations of the driving wheels, caused by inequality in the road, from affecting the beat of the valves; this is effected by making one end of each crank shaft work in bearings arranged in the side frame, whilst the other ends, which vibrate with the motions of the spring of the driving wheels, are connected to the main axle, the frame side bearings of the two shafts being on opposite sides of the engine; the main axle is made in two parts, one of which is tubular, whereon one of the wheels is fixed, and the other part, which carries the other wheel, slides into it and is secured by a nut; or the two shafts may be arranged to work in contact side by side, and thus obtain extended bearing surface when the engines are driven at different speeds.

The engine is coupled to the following carriage by a T shaped connecting piece, carried on a vertical spindle, which passes through two bushes attached to the framing of the connected carriage; this arrangement admits of both lateral and vertical action. The engine may be guided and its speed regulated by a duplex break action, operated by a single hand lever made to act on both driving wheels.

The pressure gauge consists of a metal or other chamber divided by an elastic air-proof diaphragm; above the chamber is fitted a graduated glass tube partly filled water; this tube descends into the upper division and rests upon the diaphragm, which is raised by the steam pressure, and so prevents the escape of compressed air through the water, whereby the gauge continues correct in its indications.

[Printed, 4*d*. No Drawings.]

A. D. 1862, September 11.—N° 2499.

DATICHY, Florimond.—(*Provisional protection only.*)—This invention relates to a mode for assisting to create a vacuum

behind the pistons of steam engine cylinders, also utilizing the escape or waste steam by condensing and returning it to the boiler. A closed cylindrical vessel, coniformed at bottom, receives steam direct from the boiler; the end of a plug, shaped to fit the cone is placed within the vessel, the annular opening being regulated by a screw; this vessel is placed in a larger closed vessel, within which escape steam freely enters; an annular outlet passage surrounding the conical bottom of the smaller vessel, leads into a condenser, opposite which, within the condensing chamber, which is fitted with several air valves, there is a bell-mouthed conical vessel which is connected to the feed water conduit; this vessel is furnished with a corresponding plug, which can be regulated so as to increase or diminish the outlet. When steam is admitted to the small vessel, and escape steam into that which encloses it, the steam which issues from the cone creates a strong draught into the condenser, which sucks or carries in the escape steam contained in the large vessel, and also draws cold air into the condensing chamber through the valves, whereby the steam is condensed.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 11.—N° 2505.

BARCLAY, Andrew.—(*Provisional protection only.*—This invention relates to self-propelling, boring, and winding engines. The boiler is horizontal, of the tubular class; superposed thereon is a pair of standards, which carry the axis of a beam connected at one end to the piston rods of two vertical cylinders which are placed upon the boiler. The boring rods are fixed to the other end of the beam, which overhangs the apparatus. A horizontal cylinder is fixed at each side of the boiler, either thereto or to the side framing; the pistons work parallel and give motion to a transverse crank shaft mounted across the boiler; a pinion on the shaft gears into a spur wheel on a counter shaft between the standards; this wheel carries the winding barrel; the pinion slides on the crank shaft and can be thrown in or out of gear by means of a hand lever. When two tooth wheels which are fixed at the ends of the crank shaft gear into corresponding toothed wheels attached to the bearing wheels on the travelling axle, the engine is capable of traction. It is guided by a hand wheel arranged on a horizontal shaft extend-

ing beneath the boiler; this shaft acts by means of a worm, which actuates a worm wheel on the axis of the travelling wheels. A vertical boiler may be used, and the funnel be made to serve as the standard for the overhanging beam.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 16.—N° 2545.

JORDAN, Harpur.—(*Provisional protection only.*)—This invention relates to rotary engines. Within a fixed main steam cylinder a smaller or piston cylinder revolves; the latter is mounted on the main shaft, which passes through stuffing boxes fitted on the ends of the main cylinder, but disposed so eccentrically therewith as to bring the circumference of the piston cylinder at one point in constant rubbing contact with the internal surface of the main cylinder, thereby giving to the intermediate space the form of a crescent; two longitudinal diverging slots are sunk in opposite sides of the piston cylinder, in which two piston slides are made to work in and out by means of concentric grooves or tracks formed in each end of the main cylinder, in which rollers or studs fixed on the ends of the piston-slides circulate and keep the outer edge of the slides in constant contact with the interior of the main cylinder. On each side of the line of contact between the main and piston cylinders there is a port or opening, either of which may be made to communicate with the boiler, and the other with the exhaust passage according to the desired direction of motion; the piston slides, as they rotate and pass the inlet port, successively shut off the steam from the slide preceding, which is then operated by the expansive force of the steam. The parts forming frictional steam-tight joints are to be provided with suitable packings.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 19.—N° 2572.

SAVAGE, Frederick.—(*Provisional protection only.*)—This invention relating to traction engines, consists of apparatus for separately disconnecting the driving wheels or throwing them in or out of gear with the crank shaft, so that the engine may be readily turned without stopping or shutting off the steam. The clutches are constructed with about sixteen teeth to each half, *which do not face together* on the square; the acting surfaces of

the teeth, say of the driving half of the clutch, are slightly inclined or out of square with the centre of motion, whilst the surface of the teeth of the fixed or driven half is convex. From this configuration it results that although the clutches have a slight tendency to separate when in close contact by reason of the inclined surfaces, this tendency increases as soon as they begin to open, which is due to the convexity of the acting surface of the teeth on one section of the clutch. "This construction also " allows the clutch to be readily thrown in when the engine is " running; it is also very convenient to employ clutches such as " above described when two speeds of gear are used in the traction " engine, so that the gear may be changed without shutting off " the steam."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 20.—N° 2583.

WILSON, JAMES.—This invention relates to a composition for preventing and removing incrustation in steam boilers, which consists in employing or mixing chemical precipitants for the lime with solvents for the silica, together with vegetable matter or materials for preventing the precipitated matter from caking or adhering to the internal heating or boiler surfaces. The compound is a mixture of ground malt and woody fibres, or other ground ligneous matter, caustic or carbonated alkali, and oxalate of ammonia; the latter two precipitate the lime and silica, whilst the vegetable ingredients, aided by the constant ebullition of the water, prevent a settlement and incrustation of the precipitated matter. The relative proportions of the ingredients necessary for forming the composition must depend upon the quality of the water used and the amount and nature of the matter it carries in solution. Sea water requires a large proportion of malt and ligneous ingredients, whilst for fresh or hard water the largest proportion must consist of chemical precipitants.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 20.—N° 2584.

PRINCE, ALEXANDER.—(*A communication from Eugéne Langen.*) —This invention relates to steam boiler and other furnaces, and to their feeding apparatus; the object being so to supply the fuel

and command its after position in the furnace, that the burning mass shall be of uniform thickness, and disposed within the furnace according to its state of combustion and its required quantity of air, the supply of which is regulated in an inverse ratio in relation to the fuel in a state of incandescence, and to that which is newly supplied. The furnace is fitted with separate transverse movable sets of fire-bars, ranged in level steps in succession one below the other, from the dead or door plate in front to the back of the furnace. A feeding hopper is placed in front; by means of levers, advancing and retreating motion is given to the ranges of fire-bars, the front range receiving the fresh supply of fuel from the hopper, while the burning fuel on each step is scraped off and falls upon the next in succession, and so on advancing in different progressive stages of combustion, into the furnace, step by step to the last, being then in the highest state of incandescence. The ash pit is placed under the third grate. The work of operating the levers is performed by the fireman, as in accordance with the progress of combustion fresh feeding becomes necessary.

[Printed, 1s. Drawings.]

A.D. 1862, October 1.—N° 2658.

GREENWOOD, Robert William, and MARSON, Charles John.—(*Provisional protection only.*)—This invention for utilizing exhaust steam by re-conveying it into the boiler, consists of a crescent-formed vessel which is divided into two chambers at the centre; each chamber communicates respectively by separate pipes with the exhaust passage from the engine and with the boiler; within each chamber there is a steam-tight oscillating diaphragm, extending from the centre of vibration to the chamber ends; these diaphragms are connected together by a bar, and are made to vibrate within the chambers by means of a lever, which is connected to the bar and actuated by the engine power. When the exhaust steam is delivered from one side of the piston to one chamber, the diaphragm therein moves across the chamber, which then fills with steam, while the simultaneous movement of the diaphragm in the other chamber is driving the steam, which it had previously received from the other side of the piston, into the boiler; thus the alternate movements of the diaphragms make *receptacles for the steam* exhausted from their respective sides of

the piston, and their reaction drives it into the boiler. All the pipes are provided with suitable valves.

[Printed, 6*d*. Drawing.]

A.D. 1862, October 3.—N° 2668.

ENSOR, FRANCIS, and PAYNE, WILLIAM.—(*Provisional protection only.*)—This invention relates to apparatus for regulating steam pressure in boilers, and for indicating the water level. A vertical pipe fitted at the top with an escape valve, is fixed on the top of the boiler and communicates therewith; a lateral branch projects from the side of the pipe, curves upwards and carries at the top a safety valve which is weighted to the working pressure; a bracket projects from the opposite side of the vertical pipe, upon which a hollow cylinder of double the diameter of the vertical pipe is placed; this cylinder is divided by a horizontal partition; the upper section contains a cylindrical weight block suspended by a rod to the end of the lever, which operates the escape valve; the lower section contains water, into which a pipe which communicates with the upper section descends. A small valve, weighted up to the extreme safety point, is fitted in the middle of a valve box, placed on the boiler at the side of the cylinder, communicating by a small pipe from above the valve, with the upper part of the water section of the cylinder, to which, when excessive steam pressure raises this valve, the steam gains access; its pressure therein drives the water up the small tube in the upper section and lifts the weight, which by means of the rod and lever, operates the escape valve and allows the steam to blow off; so soon as the boiler is relieved, the small valve closes, the water returns to the lower section and the block descends and closes the escape valve. A float in the boiler, by means of its rod, which is connected to a chain and pulley and slotted rod, operates the lever of the escape valve, and produces an escape of steam when the water has sunk below the safety level, or risen too high for effective working.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 4.—N° 2678.

LEE, JOSEPH, and LEE, WILLIAM.—This invention relates to traction engines, and boilers for locomotive and other purposes, and consists in giving motion to the main or driving wheels by a

pinion on the crank shaft, which gears into a loose spur wheel revolving upon a fixed intermediate stud, whereon, also loose, is another pinion attached to the loose spur; this pinion gears into another spur wheel, which is fixed upon the main axle. Other arrangements for communicating motion from the crank shaft to the main axle are described, including an endless chain and chain wheels, and an inclined shaft with bevel gearing, which admits of steel or india-rubber springs being used with advantage. The boilers are constructed in such manner, that after the products of combustion have passed through horizontal tubes into the smoke box, they return thence and rise vertically into the steam dome, whence they pass out through the shell to the chimney, which can be turned down when the tubes require cleaning.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 10.—N° 2739.

WEALLENS, ELIZABETH, administratrix of William Weallens.—(*Letters Patent void for want of Final Specification.*)—The invention relates to surface condensers for marine and other steam engines, and consists (1) in a mode of fixing the ends of tubes into tube plates, by screwing the ends of such tubes either externally or internally, so as either to take into a nut or to receive a flanged bush screwed to correspond, whereby an elastic washer interposed between the tube plate and the nut or the flange of the bush, is, by being pressed into a recess in the tube plate, made to form a steam or water-tight joint. Both ends may be fixed in the same way, or a flange may be formed round one end, and be made to press against an elastic washer interposed between it and the tube plate, when the nut or flanged bush is tightened up to bed the washer at the other end of the tube.

2. Consists in distributing the flow of water through surface condensers, by introducing suitably formed division plates into the cold water conducting chamber, and fixing such plates at right angles to the mouths of the tubes, so as to give the required direction to the condensing water.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 13.—N° 2754.

M^cCARTHY, CHARLES.—This invention relates to an automatic safety valve, which causes a discharge of water on the fire when-

ever the steam pressure rises above the safety point or the water level sinks below it. A closed chamber or box is superposed on the boiler, and connected thereto by a short flanged tubular neck, bored to receive an ordinary valve seating. Within the boiler a down pipe forms a communication between the chamber and the lowest water space therein. The valve spindle which rises vertically within the chamber, is weighted up to the maximum of safety, and the valve can only be opened by the pressure of steam when that point is passed; when this occurs, the pressure in the boiler forces the water up the down pipe, opens the valve, and by means of an outlet pipe which forms a communication between the chamber and the furnace, the water is discharged upon the fire. When there is a deficient water feed, and the consequent shortness of water in the boiler, the valve is opened by means of a lever operated by the rod of a float, which is slotted at the end to receive a projecting stud fixed in the end of the lever; so long as the stud remains free in the slot there is no action on the valve, but when by the sinking of the float the end of the slot presses upon the stud, and thereby depresses the lever end (which happens when the water level approaches the verge of danger) the valve is raised, and, as in the case of excessive steam pressure, a discharge of water is thrown upon the fire.

[Printed, 8*d*. Drawing.]

A.D. 1862, October 15.—N° 2789.

COWPER, Edward Alfred.—This invention relates to compound high and low-pressure engines, and to a mode of steam jacketting the reservoir or chamber which receives the steam after it has operated the piston in the high-pressure cylinder before it is admitted to the low-pressure cylinder, the object being to maintain the boiler temperature of the steam until it passes to the condenser or to the atmosphere. These steam reservoirs are lined with metal so disposed as to leave a surrounding space between. On entering, the steam goes at once to the central space within the lining, but when leaving the reservoir it is conducted between the lining and the shell before it engages the piston in the low-pressure cylinder. The form of the reservoir is not material, and its capacity may be varied; it may be composed of cylinders, tubes, or plates, with openings for the steam to go direct to the interior, and which only when leaving should be brought in contact with

the surrounding parts. The apparatus is applicable to engines working steam superheated on its passage from the reservoir to the second cylinder, and to all compound cylinder engines working high and low-pressure steam. It is stated that the relative capacities of the cylinders of such engines should be as 1 representing the high-pressure to 3 representing the low-pressure. The invention is exemplified by drawings and descriptions of various kinds of compound engines, including inverted cylinder direct-acting marine engines, horizontal marine engines, horizontal stationary engines, high and low-pressure beam engines, more or less relating to the disposition of the steam jacketted reservoir, and the manner of its construction to suit its varied applications, including suggestions for utilizing the hot fire draughts of boiler flues for superheating purposes, and with regard to the advisability of using vertical tubes in surface condensers, and removing air bubbles from such tubes by means of spiral brushes; also in respect to the comparative advantage of working steam expansively in the cylinders, and putting chalk or other neutral base into boilers to unite with the oil and grease introduced with the distilled water, which has been acidified by repeated boiling.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1862, October 16.—N° 2802.

NELSON, EDWARD.—This invention, relating to the construction of apparatus for heating and superheating steam and air, consists in the use of highly refractory materials in such manner as to prevent decomposition and render the apparatus perfectly steam tight. The apparatus is contained within an annular space formed between an upright cylindrical metal casing of large diameter, and a small metal cylinder concentrically placed within. Inlet and outlet passages communicate with a spiral coil of porcelain tubing, built up within supporting walls of fire-clay, which line the annular space. During the construction of the apparatus, the internal metal cylinder forms a central support, around which the inner wall of refractory material, prepared from fire-clay in a plastic state, is built. Wound around this inner wall is a wide bandage of cloth, against which the spiral porcelain tube is placed and supported; between each coil of the tube is interposed a layer of soft refractory clay, half an inch thick, and the sur-

rounding space and interstices are filled in with the same material. When the tube is complete, the spiral coil is surrounded with a cloth wrapping, which is encircled by an outer wall of soft refractory clay, and then the outer metal casing is, by the aid of a crane, lowered so as to surround and support the whole. When dry, the parts (kept from adhering to each other by the cloth wrappings) are easily separated, and then finished for the ultimate drying and burning in the kiln; when the firing is completed the parts are put into position again, and the interstices filled with a packing of equal parts of burnt fire-clay and plumbago, which is well rammed in. The spiral coil is moulded by a pipe making machine.

[Printed, 1*s*. Drawing.]

A.D. 1862, October 17.—N° 2805.

DAVIES, Jonah, and DAVIES, George.—This invention relates to rotary steam engines, applicable for use with slight modifications as rotary pumps, blowing machines, hydraulic engines or water meters. It consists of a small cylinder or drum, which being eccentrically placed within a large cylinder, is by means of radiating sliding piston plates, and the admission of steam or otherwise, made to revolve therein, and give motion to the axis which passes through the ends of the large cylinder, and upon which the small cylinder is fixed. The piston plates, three or more in number, slide diametrically in longitudinal grooves, sunk equidistant from end to end of the drum cylinder, which at one point, owing to its eccentric position, touches the large cylinder, where, within a groove sunk along the line of contact, there is an adjustable packing strip or bearing, properly maintained by springs; on both ends of each piston plate there is a projecting block stud carrying a slipper block, which fits into a concentric annular groove sunk into each end of the large cylinder, whereby as the drum cylinder revolves, the packing strips along the outer edges of the piston plates are kept constantly in frictional contact with the cylinder sides. The steam admission port opens into the large cylinder on one side of the spring bearing, and the exhaust passage communicates with the opposite side. The shaft passes through eccentrically placed stuffing boxes attached to the cylinder ends, and is supported by suitable bearings outside. The apparatus is made to change the direction of motion by means of

a valve, which when actuated by a lever sends the steam into the cylinder through the exhaust passage, and the exhaust steam through the opposite port.

[Printed, 2s. 10d. Drawings.]

A.D. 1862, October 17.—N° 2808.

JOHNSON, John Henry.—(*A communication from the Society Lecacheux, Sartre, Bernard and Company.*) — This invention relates to preventing and removing incrustation in steam boilers, being supplementary to a prior invention for which Letters Patent were granted to this patentee, bearing date 25th January 1862, N° 196.

The present invention consists in adding to the ingredients named in the Specification of the above patent, one part by weight of extract of tan or powdered oak bark at 12° Beaumé, five parts by weight of aloe or other leaves, cut into shreds, and two parts by weight of animal marrow, which will make the following compound of ingredients, each to be taken by weight in the following proportions :—

Snail or slug liquor - -	100	parts	by weight.
Carbonate of potash - -	8	,,	,,
Molasses or treacle - -	2	,,	,,
Leaf of the aloe - - -	5	,,	,,
Animal marrow - - -	2	,,	,,
Extract of tan, at 12° Beaumé -	1	,,	,,

The above proportions which may be slightly varied, have given the best results. The ingredients must be boiled together for two hours, and then when strained the liquor will be ready for use.

[Printed, 4d. No Drawings.]

A.D. 1862, October 22.—N° 2842.

SPENCE, James.—This invention relates to the use of a non-conducting compound for covering steam boilers and cylinders, steam pipes, and metallic and other surfaces, thereby preventing loss of heat by radiation. The composition for coating steam boilers, engine cylinders, and such like vessels subject to great heat or cold, consists of 1,000 lbs. weight of argillaceous earth, mixed with water, ground and beat up into a paste, to which is added 24 lbs. of oil cake, 3 gallons of train oil, 24 lbs. of cow hair, well opened and beaten in, 24 lbs. of soot, and 3 lbs. of bone dust or ash ; these ingredients are to be thoroughly compounded

and reduced to a plastic state, capable of being applied with a trowel. For a finishing coat, the following composition may be made :—to 1,000 lbs. of argillaceous earth, mix from 1½ to 2 gallons of fish oil, about 32 lbs. of oil cake, 32 lbs of cow hair, about ½ gallon of linseed oil, 24 lbs. of ground charcoal, and about 8 lbs. of glue; to the above may be added 8 lbs. of paint or colouring matter. Steam boilers may be coated whilst in use, each coating to be about ¾ of an inch thick, scored and roughed across to receive when dry the next coat. Steam pipes and cylinders may be first lapped with fibrous material saturated with the composition, upon which, when dry, successive coatings of composition may be plastered. Liquids or fluids contained in vessels coated with the composition will be protected against the external action of extreme cold.

[Printed, 8*d*. Drawing.]

A.D. 1862, October 23.—N° 2861.

FIELD, Joshua.—(*Provisional protection only.*)—This invention relates to steam engines, condensers, and boilers, consisting (1) in adapting a small high-pressure cylinder to the ordinary double piston rod arrangements of horizontal engines; this cylinder is concentrically disposed between a large low-pressure cylinder and the crank shaft; the two piston rods of the latter cylinder pass one on each side of the small cylinder to the cross-head on the other side of the shaft, the connecting rod returning to the crank; the two pistons are united by a rod, which passes through a steam tight joint between the two cylinders.

2. Consists in constructing surface condensers with a view to facilities for inspecting and cleaning the tubes, which are placed in a sloping position and open through tube plates into a chamber at both ends; these chambers are closed by removable covers. The exhaust steam enters the chamber at the highest end of the tubes, and the condensed water is delivered at the lowest part of the opposite chamber.

3. Consists in combining the ordinary tubular cylindrical boiler, with groups of return tubes contained in a separate cylinder superposed above the other; the fire draught passes from one to the other up a flue at the far end, and the two are connected in front by water communications.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 27.—N° 2884.

JOHNSON, JOHN HENRY.—(*A communication from Wilhelm Heinrich Christian Voss.*)—(*Provisional protection only.*)—This invention relates to the construction of a rotary engine, which obtains continuous rotary motion by the successive direct action of a number of single acting cylinders and pistons upon two discs, which are mounted upon two shafts placed in bearings upon the same plane, but at such an obtuse angle with each other as to bring the peripheries of the discs much nearer together on one side than the other. The cylinders are circumposed on the face of one of the discs and united thereto by ball and socket joints, through which there are steam ways into the cylinders communicating with passages formed in the disc; the ends of the piston rods are circumposed on the face of the other disc and attached thereto also by ball and socket joints. The revolutions of the discs coincide. A valve is arranged in the centre of the cylinder disc to pass steam into each cylinder in succession, the moment its position on the disc in relation to that of its piston on the other disc has passed the nearest approximate point, whence, as the discs revolve, they continue to separate until they have made half a revolution; during this time the piston has been impelled to the outer end of the cylinder; the exhaust now takes place through suitable passages in the cylinder disc, and during the remainder of the revolution the piston returns into the cylinder, to be again operated when the nearest approximate point has been again reached; each cylinder and piston in succession are operated in the same way, tending to separate the discs which move round instead, in consequence of the angle at which they are placed in relation to each other, to which rotation is due, and which is open to adjustment. Motion is given off the disc shafts by spur gearing.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 27.—N° 2890.

BÜNGER, FREDERIC LUDOVICUS HENRI WILLIAM.—(*A communication from Bernhard Andreae.*)—This invention relating to self-acting apparatus for discharging the water of condensed steam, consists of a flanged vertical pipe or tube fixed upon a flanged chamber; the lower end of the pipe is socketed to receive a bush, which forms the seating of a circular valve; placed con-

centric within the vertical pipe, there is an inner pipe of such smaller diameter, that an annular space is left between them; this pipe rises a considerable length up the vertical pipe; it is closed at the top end by a metal cap or otherwise, and at the lower end, which is cup mouthed, by a covering plate of india-rubber or other flexible material secured between a flange on the pipe end and the flange of a ring guide, which fits loosely round a circular block within the chamber; the circular valve closing upwards is bored and fixed near the lower end of the inner tube, which is entirely filled with water and hermetically closed; the top of the block is rounded and made smooth, so as not to injure the flexible cover which rests upon it and supports the weight of the inner pipe. An outflow pipe is attached to the chamber, and a fine grid for intercepting gritty or other matter, is fitted in a slide box interposed between the top flange of the vertical pipe and the next connection. The opening and closing of the circular valve is caused by the upward and downward motion of the inner tube, the effect of the rarefaction of the water contained therein, which presses against and distends the flexible cover, altering its external form from concave to convex, which causes the tube to rise; so soon as the valve is closed, condensation water begins to accumulate within the vertical tube; a general cooling of the apparatus takes place, the water in the inner tube returns to its natural density, the tube settles on the block, the valve opens, and the water runs off; as the water sinks it is followed down the vertical pipe by the steam, which again heats and expands the water in the inner tube, and closes the valve; the action being kept up by the rising and settling of the inner tube, caused by the successive alternate expansion and contraction of the water contained therein.

[Printed, 8*d*. Drawing.]

A.D. 1862, October 28.—N° 2905.

JEFFREYS, Julius.—(*Provisional protection only.*)—This invention relates to a mode of constructing apparatus for surface condensing, and heating or cooling liquids. Thin plates of metal are pressed between dies or moulds, whereby such plates are so bent or corrugated, as to form a series of parallel semicircular flutes or grooves united with narrow surfaces; the plates so prepared are placed in pairs face to face, so as to bring the narrow

surfaces together, between which thin strips of fusible soldering metal are carefully laid; several pairs of such plates are piled on each other with suitable metal packings between, and placed under pressure and heated until the soldering metal melts and unites the surfaces, in which state the pile is allowed to cool. Each pair of grooved plates is thus formed into a series of parallel tubes, which are so disposed in a condensing chamber that the steam shall pass through the tubular grooves, and the condensing water between each pair of plates. Condensers for steam engines are formed of very thin metal on this principle of construction; the condensing surface being much increased thereby and rendered more effective.

Apparatus may be so constructed for heating or cooling fluids or vapours; and rooms may be ventilated without much loss of heat, by expelling the impure air through the tubes, and drawing the fresh incoming air between them, the passages opening at the sides of the apparatus into their respective channels.

For cooling purposes it is not always necessary to solder the surfaces together.

When such pressed plates are used to form fire tubes for tubular boilers, the grooves are made wider at the ends, so as to fashion each tube with a coniform or bell-mouth, in which suitably formed shields or plates are applied to prevent injury to the tube mouths by the action of the flames.

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 29.—N° 2907.

RIPLEY, Abraham.—This invention relates to a mode of expanding the metallic packing rings of steam and other engine pistons; it is also applicable to pumps; and consists in chamfering off the periphery of the piston block in straight inclines from the centre to each side, leaving an obtuse angled ridge round the centre, so that when the piston face covers are fitted to each side of the block, a deep annular groove is formed with parallel sides and two inclines at the bottom; separate rings are turned to fit each side of the groove and bed on the inclines, leaving a space between the rings which are afterwards cut into segments and placed in the grooves under the external packing rings; a number of miniature pistons are fitted into the piston through each face plate or cover, so as to abut against the segments; these little

pistons are packed steam tight, and when the pressure of the steam is in the cylinder they force the segments up the inclines and thereby expand the packing rings sufficient to render the piston steam tight. The amount of packing pressure or friction between the packing rings and the cylinder must be controlled by regulating the collective external area of the small pistons in relation to the steam pressure. The same effect is produced on the pistons of engines operated by air or water, and on the pistons of lifting or of force pumps.

[Printed, 10*d*. Drawing.]

A.D. 1862, October 29.—N° 2921.

UNSWORTH, John.—This invention relates to steam engines, the object being to avoid compression or back pressure in the main cylinder. According "to one arrangement, the pipes or "passages employed to convey the steam to two small cylinders "alternately are placed close to each end of the main cylinder, "and additional ports, which are to prevent back pressure or "compression, are placed within about two and a half inches of "each end of this cylinder, so that when the piston reaches the "end of the cylinder it covers the port which has been opened to "prevent back pressure, but so soon as steam is admitted into "the large cylinder it moves the piston valve in the small cylin- "ders, and closes the port upon which the main piston is stand- "ing, opening at the same time a port at the opposite end of the "main cylinder; this is performed whilst the crank is travelling "over the centre. The steam admitted into the small cylinder "returns as soon as the exhaust port is opened to the large "cylinder; this arrangement prevents any escape of steam. If "preferred, the steam may be admitted into the small cylinder or "cylinders direct from the boiler."

A second arrangement relates to the employment of one small cylinder, in combination with valves at each end of the main cylinder. Two valves open in turn to allow the steam under compression to escape. In a third arrangement the valves are worked and the compression allowed to escape by means of a lever attached to a convenient part of the engine. In a fourth arrangement a small cylinder is employed, having a valve box on each end of the large cylinder; the valves are made to answer for the exhaust as well as the escape of the compression.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, October 30.—N° 2925. (* *)

LOCKWOOD, John.—(*Provisional protection only.*)—Improvements in boiler furnaces.

"These improvements consist in placing fire-clay or metal of "cylindrical or other suitable form behind the bridge in the flues "of Cornish or other boilers, which reduce the area so as to cause "the flames to circulate or pass on all sides thereof, and impinge "more keenly on the heating surfaces, whereby steam will be "generated more rapidly, and fuel economized, and the great heat "imparted to the fire-clay or metal will ignite the combustible "gases as they pass from the furnace, and thereby prevent or "consume the smoke. Such apparatus, being made hollow with "suitable arrangements, may also be employed for the generation "of illuminating gas."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 30.—N° 2926. (* *)

EASTWOOD, Henry.—Improvements in boiler furnaces. The furnace is made with two grates, one above the other; the upper grate consists of water tubes in connection with the boiler and the lower of ordinary grate bars; coal is supplied to the upper and coke to the under bars; air is admitted through the door above the upper bars, and the products of combustion pass down through the upper bars, and over the lower fire to the flues; the smoke is thus consumed.

[Printed, 1*s*. Drawings.]

A.D. 1862, October 31.—N° 2950.

SICKELS, Frederick Elsworth.—This invention relates to apparatus for steering and manœuvering ships by motive power; it is also applicable for pumping and lifting purposes. The engine cylinders which actuate the apparatus, are placed to operate on a crank shaft at right angles, which shaft is lineally disposed at the fore end of the steering wheel axis, and when required to operate, transmits its power thereto by means of friction clutches; the apparatus is under the control of the helmsman, and the valves are so arranged in connection with a separate steering wheel, that when turning the wheel in either direction, the valves are correspondingly opened and partially closed, so as to modify the force

of the steam while the wheel is in motion. The steam or fluid is conducted to the engine through a valve, loaded to regulate its pressure, and means for stopping the motion of the rudder are provided. The engine may be driven by a separate boiler, and supply feed water thereto; the exhaust steam may be condensed for the same purpose. When not operating the helm during fair weather, the engine may be disconnected and employed for pumping and other purposes; and when in port it may be connected to a winding drum and used as a hoisting engine for unloading and loading the vessel. To prevent mistakes, an indicator on deck is made to exhibit the position of the helm.

[Printed, 3s. 6d. Drawings.]

A.D. 1862, November 1.—N° 2956. (* *)

MERRYWEATHER, Moses, MERRYWEATHER, Richard Moses, and FIELD, Edward.—" Improvements in steam fire-" engines, parts of which improvements are applicable also to " other purposes."

This improved fire-engine " consists of a framed carriage, " mounted, when intended for land service, on travelling wheels; " at the hinder end of the frame is the boiler, in front of which " is placed the steam cylinder and pump. The boiler consists of " a vertical fire-box with water and steam chamber above, from " the lower plate of which descend a number of tubes arranged " around the entrance to the smoke flue, the lower ends of some " of them converging inwards to bring them into more immediate " contact with the main body of the fire. Within these tubes " are smaller ones open at top and bottom, their upper ends being " wide-mouthed or trumpet-shaped to facilitate the entrance and " downward passage of currents of solid water, unaffected by the " steam which rises externally around them. The exhaust pipe " from the steam cylinder on entering the chimney passes down-" ward to a chamber (the lower surface of which forms a baffle " plate) from whence the steam is projected upwards to increase " the draught in the fire-box. Provision is made for cushioning " the piston in the steam cylinder, by causing it to pass beyond " and close the main ports, the steam and exhaust being then " led through a smaller channel capable of nice adjustment. " Steam is admitted to the working cylinder of the engine by a

" slide valve, acted upon by a smaller steam valve which receives
" its motion from connecting rods attached to the piston rod of
" the engine."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, November 3.—N° 2963. (* *)

MUSGRAVE, James.—"Improvements in the valves of steam " hammers, and steam, hydraulic, and gas engines."

The improved valves for steam, gas, or hydraulic engines work in a cylinder, the piston of which forms the valve. The steam or fluid for working the valve, after passing through a very small slide valve, is admitted above and below the piston valve. The small side valve is moved to and fro by levers actuated by the cylinder or crank shaft, and through it steam is supplied to the piston valve, which it moves without the aid of levers, cam, or other connection. The traverse of the piston valve is governed by opening or contracting the exhaust passages at each end of the small cylinder in which the piston valve works.

[Printed, 10*d.* Drawing.]

A.D. 1862, November 4.—N° 2985.

SHIRT, Joseph, and BRIGGS, Charles.—This invention relates to apparatus for condensing the exhaust steam from high pressure engines; it consists in the use of an air-tight condensing chamber or vessel, to which the exhaust pipe is attached; the interior of this chamber is divided by a perforated partition horizontally placed near the top; the condensing water enters the upper section of the chamber through a pipe fitted thereto; a constant shower descends through the perforated partition into the lower section, where it falls upon and condenses the exhaust steam, and forms a partial vacuum which extends to the back of the piston, whilst the new steam acts successively on its faces. A waste pipe conveys the condensing water and the products of condensation from the chamber to below the water level into a well or reservoir.

[Printed, 6*d.* Drawing.]

A.D. 1862, November 11.—N° 3037.

BOOTH, William, BOOTH, Joseph, and BOOTH, Thomas. —This invention relates to engines of the rotary class; the cylinder

contains a rotating barrel placed concentric with the axis and with the interior of the cylinder, so as to form an internal annular space bounded by the ends of the cylinder; the piston is attached to the barrel, projecting therefrom in a radial line; it divides the space, and its edges revolve without friction against the circumferential interior and end surfaces of the cylinder; it consists of two plates packed apart to receive packing strips which slide round the internal surface of the cylinder, in steam tight contact. Fixed longitudinally along the outside of the cylinder are two broad projecting flanges, fitted so close together that only a narrow space is left between them, which opens into the cylinder; a resistant sliding plate by means of a combination of connecting rods, levers, and a bowl on a lever arm which works against an excentric cam, is made to slide radially in and out between the flanges, its inner edge each time reaching so far as to come in contact with the barrel, and then suddenly retreating to the cylinder surface at the moment the revolving piston reaches that part of its revolution, in order that it may have a free passage to pass. The induction steam port opens into the cylinder close to one side of the resistant slide, and the eduction or exhaust port on the other; by the time the piston has passed the induction port the resistant slide is again in contact with the periphery of the barrel, and thus forms a rigid abutment against the expansive power of the steam, to which the piston yields, and thereby communicates rotary motion to the barrel and axis. The steam may be cut off at any point in the revolution and worked expansively.

The invention is applicable to condensing and non-condensing engines, and will work in any position. Two cylinders and pistons may be combined on one shaft and worked singly or conjointly by means of a suitable clutch.

[Printed, 10*d*. Drawing.]

A.D. 1862, November 12.—N° 3042. (* *)

HARPER, WILLIAM.—(*Provisional protection only*.)—Improvements in steam boiler and other furnaces.

" The bridge of the furnace, instead of being of solid brick-
" work, as now customary, is made of perforated blocks of fire
" brick or other suitable material, and instead of leaving a passage
" for the smoke between the top of the bridge and the under side
" of the boiler or flue, the bridge is built up to the under side of

"the boiler or flue, thus causing the smoke to pass through "the perforations above referred to, and as the blocks in which "the perforations are made are heated by the fire of the furnace, "it is evident that the smoke in passing through the perforations "becomes ignited."

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 12.—N° 3049.

FAULDING, Joseph.—The object of this invention relating to locomotive engines is "to obviate the inertia and momentum" of the working parts. It consists in placing the centres of vibration of two united oscillating cylinders on a horizontal line with the centres of the axles of two driving wheels on each side of the engine, in such manner that the cylinders with the whole working gear of the engines, are carried by an independent frame supported in journals on the driving axles, and so that the relative connections of the engines therewith, shall not be influenced in any degree by the play of the springs which carry the ordinary framing of the boiler and other parts. The piston rods are coupled to the crank pins which are fixed on the bosses of the driving wheels. The cylinders are united at their bottom ends in the casting by hollow side plates, which leave open central spaces, across which there are circular chambers, which form communications between the hollow side plates, and open through one side to the valve boxes, which are fixed to the frame sides. The circular chambers are the centres of vibration; they rest on plummer blocks which are supported by hollow brackets attached to the frame sides; the exhaust steam blows through the hollow brackets, which communicate with the blast pipe in the chimney. A transverse pipe, open by a branch to the steam chamber on the boiler, unites with both valve boxes and forms the steam passage. The connections between the cylinders and the valve boxes are made steam-tight by stuffing boxes and packings. The motions of each pair of pistons coincide, the position of the crank pin of one wheel being over the axis, and that of the other wheel under the axis, so that one slide valve acts for two united cylinders, as their pistons push and pull simultaneously, but alternately above and below the axes of the wheels; at the same time the crank pins of the opposite driving wheels are on the plane of their axes, in order that both pairs of pistons may not be turning the centres at the same

time. The excentrics are bolted to the inside of the bosses of the driving wheels, and the usual link motion is introduced between the side frames, that space may be afforded for disposing a water tank under the boiler.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1862, November 12.—N° 3051.

DUNTZE, John Alexander.—(*A communication from Edward David Ashe.*)—This invention relates to a mode of communicating rotary motion to shafts or axles, and is supplementary to an invention patented by William Austin Ashe, which bears date 28th March 1862, N° 863. As applied to driving the shaft of a screw propeller, the steam cylinders are longitudinally disposed on each side close to the propeller shaft; mounted upon the end of each piston rod is a lateral driving arm or driver, which points to the centre of the shaft at right angles therewith; the centres of the cylinders and piston rods, of the guides, and of the propeller shaft, are all upon the same plane; the end of each driver is furnished with a short strong stud, which works into a return helical groove sunk into the surface of the shaft, and extending a length corresponding with the stroke of the piston; this groove is endless, running two or three turns in one direction, and then making the same number of turns in the other direction, crossing at every turn; the pitch will be regulated by the required speed of the shaft, in relation to a given number of piston strokes; one driver is set half a stroke in advance of the other when the groove makes two complete turns in each direction, and a third of a stroke in advance when there are three turns each way in the groove; both drivers, by pressing alternately on each side of the groove or return endless spiral, compel the shaft to rotate.

Cylinders may be constructed with a great length of stroke, and the incline of the groove, according to the pitch, be made more or less favourable to the action of the driver studs, which never leave the grooves. The reversing of the engines is effected by the ordinary link motion. The air-pump piston rod may be actuated by the groove, which then becomes the driver, and the engine may be made compact by placing the condenser below the shaft.

In the case of "Ashe's" patent, the grooved shaft passes through the cylinder, and the drivers are attached to the piston body, which is not allowed to turn.

The principle of the invention may be modified and applied to locomotives and to other engines.

[Printed, 1s. 4d. Drawings.]

A.D. 1862, November 14.—N° 3067.

WILSON, Edward Brown.—(*Provisional protection only.*)—This invention relates to a peculiar mode of connecting a pipe for the conveyance of steam, air, gas, or other fluid, to oscillating or vibrating cylinders. As an example of its application, in the manufacture of iron and steel, to the oscillating converting vessels, in lieu of the ordinary method of conveying air thereto, by passing it through the trunnions, "it is proposed to bring the blast "pipe centrally with, but disconnected from the trunnions or "centres on which the vessel turns, and as near to the same as "may be convenient, at the end of which pipe a suitable connect-"ing joint is made that will allow the pipe to revolve freely, such "pipe being in the form of a radial arm, and connected to the "other end with the atmospheric vessel. This mode of convey-"ing air to an atmospheric converting vessel is equally applicable "to the conveying of steam to the oscillating cylinders of steam "engines, and may be employed in all cases where steam, air, "gas, or fluids are required to be conveyed to vessels or recep-"tacles which oscillate or vibrate upon trunnions or centres."

[Printed, 4d. No Drawings.]

A.D. 1862, November 15.—N° 3081.

JAMES, William Henry.—This invention relates to steam engines, and to generating steam for the working of engines generally, and especially very high-pressure steam for actuating engines described. 1. The generator is formed of a series of flat hollow slabs or chambers, constructed by preference with wrought-iron plates rivetted or welded together, and so horizontally disposed within a metal casing over the fire one above another, that a thin space is left between each; the flat surface plates of these chambers are perforated with holes to correspond, wherein short fire tubes are fixed, which serve as passages for the smoke and heated products of combustion to the chimney, which is mounted on the top of the apparatus. Means are provided for raising and lowering the furnace. The flat chambers of these generators may be properly moulded and formed in cast iron or other more suit-

able metal, or they may be formed out of solid slabs, and drilled to form the transverse channels and internal cavities.

2. Consists in applying very high-pressure steam through the medium of water to the working of engine pistons, which is supplementary to an invention described in the specification of a patent granted to this inventor, bearing date 4th September 1855, No. 1998. The improved apparatus consists of two very strong vertical tubular closed vessels, which are partly filled with water; the bottom of each vessel communicates, by means of separate pipes, with a single-acting engine cylinder; steam at very high pressure is alternately admitted to the upper part of each tubular vessel, wherefrom the steam pressure drives the water into the cylinder, where it operates the piston; this action is kept up alternately by the two tubular vessels, into which respectively the water returns from the cylinder, the steam therein having been condensed by water injected from a refrigerating apparatus, in which, through coils of pipes, there is kept up a constant current of cold air.

[Printed, 10*d*. Drawing.]

A.D. 1862, November 19.—N° 3108.

ARBÒS, JACQUES.—This invention relating to the generating of gases, and obaining motive power therefrom, and to the apparatus employed for the purpose, consists of a gas engine, combined with a compound generator, which produces both gas and steam. This generator comprises a central vertical furnace in the form of an inverted cone with a closed convex cover, upon which is superposed a smaller conical chamber with a removable cover; the furnace is surrounded by water contained within an upright cylindrical metal shell, the convex top of which closes round the small chamber; the fire-bars are placed near the bottom of the furnace with closed ash-pit underneath, into which the atmosphere is forced through a pipe; the fuel is fed down through the top chamber by lifting the cover; the end of a bell mouthed pipe is introduced from above into the furnace, through which are passed tar, oils of resin or petroleum, and of schist or other fatty matter, according to the richness in carburets of hydrogen that it is desired to impart to the gaseous mixture; steam is sometimes introduced. A small enclosed furnace is placed beside the generator, whence by means of a pipe the gaseous products are con-

veyed to the small furnace, where all the residue of carbonic acid and vapours is decomposed; this furnace is connected with the engine by the supply gas pipe, which is attached to the valve box containing a plug valve; the rotating movements of the plug valve, which is actuated by an excentric on the crank shaft, alternately admits the gas to each side of the piston, which is driven backwards and forwards by the sudden expansion of the gaseous mixture, when, by means of an electric spark, communicated at the proper moment, it is ignited alternately at each end of the cylinder by means of a commutator and platinum wires. The cylinder is enclosed in a water-tight jacket, by means of which a double purpose is answered, viz., cooling the cylinder and heating the feeding water, which makes a circuit therein before entering the boiler.

[Printed, 6*d*. Drawing.]

A.D. 1862, November 19.—N° 3109.

BROOMAN, Richard Archibald. — (*A communication from Pierre Antoine Delafond and Joseph Corradi.*) — This invention relates to the construction of boilers, condensers, and superheaters, and consists in using helical instead of straight tubes. "The " tubes may have one or more turns in their length. The inven- " tion also consists in obtaining similar effects in straight tubes " to those resulting from the employment of helical tubes by " fixing therein or thereon screw or twisted vanes."

"In boilers, however, in which the products of combustion " pass inside the tubes such vanes will not be applicable, because, " not being in contact with water they would be rapidly con- " sumed; they apply, however, in condensers and superheaters, " and may also be used in boilers with vertical tubes round " the outside of which the gases and products of combustion " pass."

[Printed, 8*d*. Drawing.]

A.D. 1862, November 21.—N° 3128.

NAPIER, James Robert, and RANKINE, William John Macquorn.—(*Provisional protection only.*)

This invention comprises steam engine slide valves, and plans and modifications of boilers. For high pressure, adaptable to marine engines, a boiler is constructed of four vertical shells with hemi-

spherical tops. Two or three of these shells are fitted with furnaces the flues from which are contracted and horizontally bent to communicate with a chamber within each of those shells without furnaces; these chambers contain vertical water tubes, between and amongst which the gaseous products from the fire pass downward into a flue which opens upwards into the central space formed between the four boiler shells. In some cases the furnaces and chambers are connected by horizontal flues, and a fan is used to ensure a draught. All the four shells may be made to unite at top with a single steam dome containing a central flue tube for the upward passage of the hot draughts to the chimney. Boilers may consist of one, two, or more horizontal cylindrical shells, each fitted with a furnace and tube chamber, or when long enough with two furnaces for firing at each end, and with downward flues communicating with an external uptake. With regard to valves, the invention relates to double slide valves actuated by the link motion. The main slide valve is moved by excentrics, which are set to operate precisely on the valve only with regard to the exhaust by means of an ordinary link motion; this valve admits the steam to the cylinder; the other, or cut-off expansion valve, which consists of a plate with a central opening, works at the back of the main slide valve; it is worked independent of the main slide by a third excentric fitted on the shaft in such a position that the centres of three excentrics form an acute-angled triangle. The expansion is varied by means of the link motion in the usual way.

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 24.—N° 3151. (* *)

HAWTHORN, ROBERT, and HAWTHORN, WILLIAM.—" Improvements in pump valves."

This invention consists in applying an annular double mitre valve to pumps of every description; but specially adapted for the air pumps of surface condensing engines; also, in the application for the same purposes of a peculiar ball clack or valve. The mitre valve contains an annular space between the inner diameter of the outer and the outer diameter of the inner mitre of sufficient area to allow the passage of water. The lid of the valve is formed of cast iron and wood. The lid of the valve is guided by a centre bolt with a collar on the top end of it. The ball clack or valve

consists of a circular seat of hard wood fitted into a plate forming the bottom of the valve box, upon which a ball falls and closes the passage at each stroke of the pump.

[Printed, 8*d*. Drawing.]

A.D. 1862, November 25.—N° 3163.

HENDERSON, George. — (*A communication from Hugh McLardy.*)—This invention, relating to steam engines, "consists "in a peculiar combination of parts by which some of the steam "generated may be used in two or more cylinders in succession "without that back pressure on the piston in the first cylinder "which has heretofore resulted when using steam expansively in "two or more steam cylinders. The combination is such that "each of the steam cylinders is capable of being put in commu-"nication with a condenser or with the outer atmosphere on one "side of the piston when steam is being admitted into the "cylinder on the other side of the piston. To accomplish this "the steam is expanded from the first steam cylinder into a "vessel (which I call an accumulator), from which the steam is "supplied to another steam cylinder, the communication between "the first steam cylinder and the accumulator being closed by a "suitable valve when steam from the accumulator is being sup-"plied to another steam cylinder. The working of the machinery "is such that on opening the exhaust from the first steam "cylinder the steam expands into the accumulator of an addi-"tional steam cylinder, and then to the condenser, if only one "additional cylinder be employed, but if more than one addi-"tional steam cylinder be used then the exhaust having been "opened to the first accumulator it is cut off therefrom, and the "exhaust steam is then allowed to expand into the accumulator "of a second additional steam cylinder before the exhaust of the "first cylinder is allowed to pass to the condenser. It is "preferred to employ two accumulators and two additional "steam cylinders."

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1862, November 27.—N° 3181.

AULD, David, and AULD, David, junior.—This invention relating to working furnaces and steam boilers, self-acting apparatus for regulating the supply of air thereto, and other self-

acting apparatus for supplying feed water, including a steam whistle, consists, for supplying air to a furuace, of a sliding panel arranged in front of the furnace door, which is formed with a series of oblique openings. The panel is actuated by connections with Mr. Auld's self-acting damper, patented by him 9th November 1844, so as to increase or diminish the supply of air to the furnace according to its requirements and the rate of combustion. For supplying feed water to boilers, the apparatus consists of a closed vessel in communication through a stop valve with the water supply; a small steam pipe forms a communication between the top of the vessel and a closed valve box placed above its level, containing a valve balanced by a lever and weight. A larger or down pipe enters the vessel near the top, and bends down with open end near to the bottom; the other end of this pipe communicates with the boiler through a back pressure valve; it also branches to a small box which is divided by a flexible diaphragm, on which rests the end of a vertical rod enclosed within a vertical pipe, which forms a communication between the box and the under part of the balance valve; a small steam pipe also enters into the valve box under the valve; the lower end of this pipe reaches down through the skin of the boiler to the working water level. When not in operation, the apparatus is full of water and in a state of equilibrium, but so soon as the water sinks below the end of the steam pipe, the steam rushes up, and, assisted by the pressure below the diaphragm, lifts the balance valve, and passes through the valve box and top steam pipe into the vessel, wherefrom as soon as the pressure is equal to the pressure in the boiler, the water, assisted by its own gravity, flows through the down pipe into the boiler. The steam whistle is arranged to act by a tube in connection with the float, which, when the water sinks below a safe level, has drawn a side orifice made in the tube, below the stuffing box through which it passes, so that the steam can escape into the tube and sound the whistle.

[Printed, 6*d*. Drawing.]

A.D. 1862, November 27.—N° 3182.

LINTON, John Livingston.—(*A communication from Thomas Shaw.*)—(*Provisional protection only.*)—This invention relates to generating steam in boilers by heat obtained from the combustion of ignitable fluids, such as petroleum and other mineral oils or

hydro-carbons, and to the apparatus employed for the purpose. The fluid is contained in a reservoir situated conveniently near the boiler and at a suitable elevation, whence through a pipe the fluid passes into a large open vertical tube, placed in front of the boiler above the level of the top of the furnace; from this tube the fluid is conducted over a closed heating plate, and thence through a down pipe to the lower part of the furnace between two semi-circular vaporizing vessels or pans, the edges of which, whereon the heated fluid flows, are raised and serrated or checkered, for the purpose of retaining the fluid during vaporization. The fluid begins to vaporize while on the heating plate, over which there is a current of air and steam passing into the furnace, which commingling with the vapour generated on the heating plate, becomes highly inflammable when mixed with the vapours generated in the semi-circular pans, around which the combustion of the fluid is kept up. The flaming gases fill the furnace, play under the heating plate, and pass off through the flues and tubes of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 28.—N° 3188.

CAIRD, James Tennant.—This invention relating to steam engines, consists in arrangements and operative details connected with the valvular movements of steam engines, especially those of the oscillating class. The working cylinder is fitted with two separate valve boxes for the working slide valves, and two for the expansion slide valves on the steam belt. These latter valve boxes and valves are disposed on each side of that trunnion through which the steam enters, and are worked by a double lever arm on the link; the two main working valves are disposed one on each side nearer to the exhaust trunnion. A cranked stud is screwed laterally into a segmentally slotted bar or cross-head piece, similar to that ordinarily employed for communicating motion from excentrics to main slide valves in connection with oscillating cylinders; the end of this stud turns up and terminates in a large eye, horizontally bored out to embrace a traversing cylindrical bush recessed laterally at each side to fit into the curved slot of the expansion lever link, wherein to and fro the bush traverses. The motion of the excentric is conveyed to the valves from the stud as a centre; one end of the link is jointed to, and receives vibrative

action from the excentric rod for operating the valve ; the other end of the link is jointed to the lower end of a pendent radius rod, the upper end of which is either fitted with a strap to embrace a collar on the main shaft, or fixed to a stud placed as near as possible to the centre of the shaft ; the lower end of this rod, which has no longitudinal traverse, and forms the fixed supporting centre for the link, is fitted with an adjusting screw, spindle, lever, and link movement, for varying the effective throw of the link, and thereby altering the expansive action of the valve. This system of valve gear is applicable to all steam engines, and is available for both the main slide valves and separate expansion valves. The adjustable radius bar always keeps the centres correct, and forms a steady fulcrum for the link motion.

[Printed, 10*d*. Drawing.]

A.D. 1862, November 28.—N° 3195.

DELANY, Joseph Francis, and OKES, John Charles Raymond.—This invention relating to compound high and low-pressure expansive steam engines, consists in making the slide valve of the high pressure cylinder with a lap at each end, and the slide valve of the low pressure cylinder without, or with very little lap. Both valves are to be moved by any suitable means, but so that at the commencement of the stroke (which is simultaneous and in the same direction by the pistons in both cylinders), the high-pressure slide valve may precede the movement of the low-pressure slide valve. In some cases where the high and low-pressure cylinders are placed end to end and worked by one piston rod, and the two slide valves are worked by one excentric and one valve rod, the dwell on the low-pressure valve, after the high-pressure valve has started, is effected by making the bridle frame fit to the length of the high-pressure valve, and the bridle frame of the low pressure somewhat longer than its valve, in order that at the beginning of each stroke this atter bridle has to move a short distance before it touches and actuates the low-pressure valve, during which time the high-pressure valve shall have commenced its traverse ; and (as shown by the drawings) when two cylinders are placed side by side, and the two valve spindles are moved by one crosshead actuated by one excentric rod, the eye at one end of the crosshead is cross pinned to the spindle of the high-pressure valve, whilst the low-pressure valve spindle works

freely through the eye on the other end of the crosshead, and is allowed to slide a short distance at the commencement of each stroke, before it takes up and gives motion to the valve.

[Printed, 1s. Drawings.]

A.D. 1862, November 28.—N° 3197.

DUDGEON, ALEXANDER.—This invention relates to the manufacture and preparation of a packing, especially applicable for use where superheated or high-pressure steam is employed, and for other general purposes. It consists (1) in plaiting cotton or other vegetable fibre into a gasket, or otherwise twisting and doubling it into a rope, with or without the introduction of an elastic or non-elastic core. 2. Steeping the vegetable fibre either before or after it is manufactnred into a gasket or rope, in a solution of silicate of potash, or silicate of soda, or such other chemical solution as will render vegetable fibres capable of resisting heat. The fibre or gasket is submerged in the chemical solution for such length of time as will complete its perfect saturation and power of absorption, after which it is dried for the next process (3), which consists in steeping it in melted paraffine mixed with blacklead or French chalk, or with an amalgam of mercury and tin, or such other amalgam as possesses lubricating qualities. 4. After the gasket or rope has absorbed as much of the last named compound as it will take up, it is passed between rollers so that it shall become thoroughly incorporated, such rollers being furnished with annular grooves, for the purpose of compressing the rope or gasket and moulding it to the required form for use.

[Printed, 8*d*. Drawing.]

A.D. 1862, November 29.—N° 3207. (* *)

MOULE, HENRY.—Improvements in locomotive engine furnaces.

"The bottom and sides of the ash-pit are closed water-tight "in order to its containing water below the fire-bars. At the "sides of the ash-pit openings are formed for the admission of "air to the fire; over these openings slides or covers are used in "order to regulate the admission of air, and when desired, to "shut off the supply of air altogether, a steam pipe is applied "between the ash-pit and the steam boiler in order that steam "may be admitted to the ash-pit. On the steam pipe is a cock

" or valve by which the supply of steam to the ash-pit may be " regulated or shut off. Into the ash-pit a mixture of oil or " oily or fatty matters mixed with powdered coal is to be intro- " duced, and a supply of water is to be constantly kept up in " the ash-pit so as to touch the fire-bars, or to come as near " thereto as may be. On the fire-bars alternate layers of coal or " coke, and chalk, limestone, or lime, are to be placed sufficient " to fill the fire-box to the desired height."

[Printed, 8*d*. Drawing.]

A.D. 1862, December 1.—N° 3220.

CLARK, William.—(*A communication from William Foster and Robert Foster.*)—This invention relates to rotating apparatus applicable as a pump, water meter, hydraulic motor, or a steam engine. It consists of a fixed cylindrical case, wherein, upon an axis which works in eccentric bearings on the cylinder ends, is fixed a revolving drum cylinder of much smaller diameter; the eccentricity of the axis with regard to the inner surface of the cylindrical case, brings the periphery of the drum at one point close to the case, so as to leave a crescent-formed space between their two surfaces. Two longitudinal mortices are cut at right angles with each other completely through the drum cylinder, intersecting each other at the centre; in these mortices are placed to slide, two piston plates, the ends of which are furnished with packing strips, kept in constant contact as the drum revolves, with the cylindrical case, which must be bored slightly elliptical so as to deviate almost imperceptibly at opposite sides from a true circle. The admission and emission passages to and from the cylinder open at each side on the plane of the drum axis, and suitable packings are employed round the axis and drum end. The flow of steam or fluid is continuous, and so acts against the ends of the piston slides as they come round in succession, as to impart rotary motion to the drum and axis, which must be driven, when the apparatus is used as a pump.

[Printed, 10*d*. Drawing.]

A.D. 1862, December 4.—N° 3252.

BRADDOCK, James.—This invention consists of apparatus for clarifying and purifying the feed water of steam boilers, and for effecting its constant circulation. The apparatus is shown as

applied to a double flued horizontal boiler; it consists of an open metal cistern or trough horizontally fixed within the boiler, partly above and partly below the water line; a longitudinal tube with lateral open branches is fixed along the lowest water space in the boiler; beneath the centre of the steam dome there is a vertical spiral action lifting pump, which rises above the top of the trough to which it is connected above the water level by the end of the delivery spout, which is flanged round for that purpose; the lower end of the pump rests upon and forms a rectangular junction with the horizontal tube communicating therewith; the pump rod is furnished with a thin metal helical spring or archimedean screw, which revolves within the pump cylinder; the upper end of the pump rod rises to the base of the steam dome, where it carries a number of radiating spiral vanes or blades, which revolve within a circumscribed area formed in the boiler plate for the upward passage of the steam, the force of which when the boiler is at work, is considerable; this force, by acting upon the helical faces of the blades, imparts rotary motion to the pump rod and sets the pump in action, which draws the turbid water from the bottom of the boiler through the lateral branches into the horizontal tube, and thence up the pump tube into the cylinder, whence it is delivered through the spout into the trough, wherein a metal plate is fixed opposite the mouth of the spout to prevent any disturbance of the water and cause a quiet flow. The sedimentary products are removed from the bottom of the trough by means of a pipe and blow-off cock. A constant circulation of the water is thus kept up by the pump when the boiler is at work.

[Printed, 10*d*. Drawing.]

A.D. 1862, December 6.—N° 3271.

THORP, Robert.—(*Provisional protection only.*)—This invention relates to a mode of covering steam boilers and other surfaces for preventing loss of heat by radiation or diffusion. It consists in enclosing the exposed parts of boilers and other heated surfaces within a sheet metal covering or casing, made sufficiently large to form a uniform open space or cavity between the enclosed heated surface and the inner side of the case, the intervening space thus formed is filled with dry sand (sea sand by preference), and the external surface of the casing is covered with a coating of plaster

of Paris, or other suitable non-heat-conducting material, or with narrow strips of wood bound or held together edgeways by thin metal bands, known as "wood lagging."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 8.—N° 3283.

BUDDEN, JOHN LEGGETT.—(*A communication from Woodford Pilkington.*)—(*Provisional protection only.*)—This invention relates to "means or apparatus for obtaining and applying motive power " for propelling and other purposes," and is supplementary to a prior communication from W. Pilkington, for which Letters Patent were granted to this patentee, dated September 22, 1860, N° 2317. The present invention consists "in the application of " a fixed steam guard or guards (by preference of a cylindrical " form) to the screw propeller or turbine wheel described in the " specification before referred to, and within the circumference of " which the blade or vanes of the screw or turbine wheel revolve. " This 'guard' is suitably fixed so as to be entirely independent " of the 'screw' or 'turbine' wheel revolving within it. The " inner circumference of this steam guard is furnished with floats " or steps which cross the direction of the pitch of the screw " somewhat like the steps of a treadmill or teeth of a wheel with " internal cogs, and upon which the steam or other propelling " medium is caused to impinge as it issues from the passages " terminating at the periphery of the blades or vanes of the screw " or turbine wheel, by which arrangement, in the application of " this invention to a submerged screw propeller, the steam or " other fluid in discharging is projected against the 'steam " 'guard' in place of going directly into the water, as described " in the former specification. The guard or cylindrical ring may " completely surround or enclose the screw or turbine, except " being open at each end, or it may be formed in belts or zones " placed over the emitting orifices. The steam passages are, by " preference, lined or protected by non-conducting material in " order to avoid condensation of the steam or vapour in its " passage from the steam pipe to the emitting orifices."

[Printed, 4*d*. No Drawings.]

A. D. 1862, December 8.—N° 3294.

JOHNSON, JOHN HENRY. — (*A communication from Joseph François Bérendorf.*) — This invention relates to multitubular

boilers, and to fixing the fire-tubes in their respective tube plates without rings or ferrules. It is proposed to adapt an exhausting fan near the chimney flue for increasing and diminishing draught, and directing or forcing the products of combustion into the ash-pit, to be again drawn through the boiler, or into special flues for heating, drying, or warming workshops, or direct to the chimney. The barrel of the boiler is rivetted to the fire-box end, which is surmounted by a steam dome. There are two horizontal sets or groups of fire tubes; those of the lower set are fitted at one end into the back of the fire-box, and at the other end into a back tube plate which forms the front of a combustion chamber; one end of the upper or return set of tubes is fitted into the upper part of the back tube plate, and the other end opens out over the furnace doors through the front of the boiler, into a front chamber communicating with the fan and chimney, the ash-pit and the other flues, valves and dampers being provided for sending the hot draughts from the boiler in the direction desired. The last operation to complete the boiler is the fitting in of the tubes, preparation for which is made by two slightly tapered broaches or cutters fixed upon a rod, which is inserted into the respective holes in the tube plates, which receive the ends of a tube; by turning the rod and cutters the holes are made slightly coniform in one direction; the ends of the tubes, which are shaped to correspond, are drawn or forced simultaneously into the tube plates, by means of a rod screwed at each end, which is passed through the tube; a washer which acts on the large end of the tube, is held thereto by a nut on that end of the rod; a flanged resisting washer is placed on the other end of the rod to act against the tube plate, and another nut acts against this washer, and by degrees draws the rod, which then, by means of the washer at the other end, forces the tube home. When it is required to withdraw a tube, the small washer operates on the small end of the tube. A few gentle strokes from a hammer upon the small washer greatly assist both operations.

[Printed, 10*d*. Drawing.]

A. D. 1862, December 10.—N° 3307.

INGLIS, WILLIAM.—This invention relates to steam boilers constructed in two distinct parts called "furnace section" and "tube section," which communicate with each other by means of short tubular pipes for the flow of water and steam, and by

short flue tubes for the passage of the products of combustion. The furnace section is square, surrounded by water space, and surmounted by a large cylindrical steam dome about equal in diameter to the width of the furnace. The tube section is upright cylindrical, and contains a central "flame chamber," made annular by a large vertical water tube which opens to the water space above, and centrally amongst an annular group or cluster of vertical fire-tubes below, upon which the flame chamber is supported: the upper tube plate forms the bottom of the flame chamber, and the lower tube plate the cover of a basement flue chamber, upon which this section of the boiler is superposed. The working water level is established in the lower part of the steam dome, above the level of the top of the tube section which is always full of water, kept in circulation through the furnace section by its ebullient action and the rising steam. The flaming gases rise from the fire to the crown of the furnace, and course through an upper connecting flue passage into the annular flame chamber, thence descending through the group of vertical fire-tubes into the basement chamber, whence they again rise up flues formed between the sections by enclosing plates, and then pass off to the chimney. Four external tubular bends form additional water circulating communications between the water space in the steam dome and the top corners of the furnace shell.

These boilers in double section are arranged in series for marine purposes, and in some cases for the sake of economy a brickwork furnace is adopted, the water circulation being effected through external pipes uniting the water space of the steam dome with the lowest water spaces of the tube section.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1862, December 13.—N° 3340.

AITKEN, Russel.—(*Provisional protection only.*)—"This in-
" vention relates to a peculiar system or mode of actuating the
" driving wheels of locomotive engines, with a view to the pre-
" vention of the great oscillation which occurs when using out-
" side cylinders. According to this invention it is proposed to
" transmit the power of both pistons to the centre of the driving
" axle in place of to each driving wheel separately. For this
" purpose a hollow driving axle is used, through which passes a
" straight driving shaft having a single crank fitted thereon at

"each extremity outside the wheels. This driving shaft is "coupled in any convenient manner with the hollow axle at a "point central or nearly central with the length of the axle, and "is supported near its extremities by a bush in the axle, or by "collars, forged or otherwise formed or fitted upon the driving "shaft, or on the interior of the hollow axle."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 16.—N° 3354.

VARLEY, JOHN, and CROWTHER, JEREMIAH.—This invention, relating to "steam engines and apparatus connected there-"with," consists—1. In an arrangement of slide valves. To each admission port of the cylinder there are three valves or plates; that which works on the cylinder facing admits the steam to the cylinder, and is termed the steam valve; the second is the cut-off valve, this works on the back of the steam valve; these two have openings which correspond with the cylinder ports; the third valve faces or works on the back of the cut-off valve, and is worked by a separate spindle connected with the governor. The steam and cut-off valves are worked in the usual way; the latter can be worked by connections with the parallel motion. 2. Relates to an arrangement of two exhaust plates or valves, which are actuated at the proper time by a stud, attached to the crosshead or slide block, coming in contact with two lever arms connected with the valves. 3. Relates to forming a recess in the cylinder face for the reception of the exhaust valves; this part of the invention may be modified to suit engines of differing construction. 4. Consists in arranging the exhaust valves to operate inside the cylinders, or working both plates on facings formed in the exhaust ports. 5. Relates to another disposition of cut-off valves, arranged to act by connection with the governor, and so actuated by connections with the radius rods of the parallel motion that when one valve is raised the other is depressed; the extent of motion is regulated by a coupling bush upon each of the connecting rods, which are divided and the ends screwed respectively with left and right-handed threads to fit corresponding internal threads cut in each end of the bushes, which when lineally uniting the two halves of the connecting rods, will lengthen them by being turned in one direction, and shorten them by turning the bushes the contrary way, so as to draw the ends of the connecting rods towards each other. Two other arrangements for operating the cut-off valves are described.

6. Consists in so arranging a vertical high-pressure cylinder in connection with a horizontal low-pressure cylinder, that the water of condensation shall pass off with the exhaust steam. 8. Relates to the formation of piston rings arranged in two or more parts, which are severally forced apart and pressed against the working surface of the cylinder by spiral springs working on piston guides suitably adjusted in steam-tight chambers, formed at one end of each segmental division of a ring. 9. Relates to cylindrical boilers with two furnaces, which unite beyond their bridges and form a combustion chamber, out of which the hot draughts descend through a vertical flue into a brickwork chamber beneath, whence they rise up a second flue passage into another chamber within the boiler, which is connected with a third chamber by a short passage; thence the draught descends out of the third chamber to beneath the boiler and rises further back into a fourth chamber, which is connected to a fifth, whence it descends again beneath the boiler and away to the chimney, the number of chambers being regulated by the length and capacity of the boiler.

[Printed, 3*s.* 10*d.* Drawings.]

A.D. 1862, December 23.—N° 3421. (* *).

PIEPER, CHARLES.—(*Provisional protection only.*)—"A new "improved governor for steam engines, turbines, water-wheels, "and other machinery, with valvular arrangements to regulate "the speed of the same."

"An apparatus is provided in which two suction and press "pumps are worked by a shaft with two excentrics, which by "suitable means is connected with the driving engine or motive "power. These two pumps carry a continual stream of water "into a particular cylinder, in which a piston is moved in pro- "portion to the quantity of the entering water. The piston is "directly connected with two valves, one of which is for the "outlet of the water; the other valve regulates the inlet of the "steam, water, or other motors into the driving machinery."

[Printed, 4*d.* No Drawings.]

A.D. 1862, December 24.—N° 3430. (* *)

HINDE, THOMAS CALLENDER.—Improvements in furnaces for generating carbonic oxide to be used as fuel in combination with atmospheric air.

"In constructing furnaces or apparatus according to my inven-
"tion for generating carbonic oxide, I construct a closed chamber
"of brickwork, on the summit of which chamber is a hopper.
"The said hopper may be made to communicate with or be shut
"off from the said chamber by means of a sliding valve or
"damper. At the bottom of the said chamber are a door or
"doors, which may be opened when required, but which are kept
"securely closed while the furnace or apparatus is in use. At
"one or more sides of the said chamber, and at about one-third of
"the height of the said chamber from its bottom, are one or
"more openings, into which tuyeres are inserted, and near the top
"of the said chamber is a pipe, tube, or culvert, by which the
"carbonic oxide produced is conveyed away to the steam boiler
"or other furnace or place where it is to be burned."

The patentee states that the invention "is particularly applic-
"able to the boilers of marines engines, as the chambers for gene-
"rating carbonic oxide may be placed in any convenient part of
"the vessel, and at a distance from the steam boilers."

[Printed, 10*d*. Drawing.]

A.D. 1862, December 27.—Nº 3459.

PETRIE, James.—This invention, relating to slide valves for steam engines, consists (1) in a mode of removing steam pressure from slide valves by opening a portion of their back surface to the atmosphere or to the condenser. The slide valve is of ordinary construction, worked by means of a valve rod in the usual manner. Mounted upon screw studs, on the face of the valve box, there is a cross bar, through the centre of which a loose pin slides, and at its lower end, by means of a helical spring, is made to press against a bar fixed across a hollow piston, which is fitted through a stuffing gland in the front of the valve box. The annular face of the piston rests upon a plate which is attached to the back of the valve, and is of length sufficient during the motions of the valve always to cover the piston face and prevent any escape of steam through the central opening. A nut on the end of the sliding pin, acting against the cross bar, regulates the outward pressure on the piston and thereby prevents a lifting of the valve.

2. Relates to a valve which, in addition to the usual sliding motion, partially revolves. This valve is cylindrical in form, and open at the ends; it is fixed on a central axis which acts as the valve

rod, and rests in a semi-circular seating. Each of the ports consists of four separate passages, and there is a corresponding number of openings formed through the cylindrical valve. When these openings are coincident with the ports, then the alternate sliding motion will close them as in the ordinary slide valve; but if during its reciprocating motion the cylindrical valve be more or less turned, then the openings will be brought partly or entirely opposite the solid parts of the seating, and the steam be partly or completely shut off before the sliding motion alone would have effected it. This turning of the valve is accomplished by imparting to the valve rod rotary motion during its sliding action, by suitable mechanical arrangements; it may also be effected by the governor.

[Printed, 10*d*. Drawing.]

A.D. 1862, December 29.— N° 3465. (* *)

TOLHAUSEN, Frederick.—(*A communication from Edward John Biddle.*)—Improvements in furnaces for burning petroleum or coal oil as fuel.

" Instead of a grate or bars now used, the bed of the furnace is " constructed solid, to prevent the escape of the fluid. This bed may " be made either smooth or corrugated. The draught is obtained " through a grating in the side or end of the furnace, which " admits the air but confines the flame, and an additional supply " of air comes to the flames through pipes terminating within the " walls of the furnace. The oil enters the furnace at the bottom, " and is at first ignited by surrounding the mouth of the pipe " through which it passes with a small quantity of burning coal. " A cap may be placed over the furnace for protection, in case " the flame should escape through the grating. Tanks for holding " the oil are provided with pipes which permit the escape of " explosive gases."

[Printed, 10*d*. Drawing.]

A.D. 1862, December 30.—N° 3480.

BESLAY, Charles.—(*Provisional protection only.*)—The object of this invention is to prevent condensation of steam within the cylinders of steam engines, and for this purpose such cylinders are so enclosed within jackets or cases that a clear surrounding space of from two to three inches is left between the case and the

cylinder. An air heating chamber is so disposed in some convenient part of the boiler or chimney flue, as to be surrounded by the hot draughts, or played upon externally by the heated or flaming gases; between the interior of this chamber and the space within the cylinder cover there are two pipes of communication, through which, by means of a fan within the chamber, a constant circulation of air heated to about 600° Fah. is kept up. Surrounded by this intermedium no condensation can take place within the cylinder, which becomes a means of superheating the working steam as long as the proper temperature of the air current is maintained. The cylinder case is covered with non-heat-conducting material. Instead of heating air for the purpose, a portion of the heated products of combustion may be forced round the cylinder and returned again to the flues.

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 31.—N° 3486.

CLARK, WILLIAM.—(*A communication from Jean Jacques Meyer and Adolphe Meyer.*)—(*Provisional protection only.*)—This invention for arranging and propelling railway trains, consists in discontinuing the use of heavy coupled engines, and employing instead a number of engine trucks, each with six or more coupled wheels, the object being to distribute the power of adhesion, and consequently the weight required by the old system to be concentrated in a single engine, amongst two, three, four, or more trucks, and driving each separately by means of a pair of cylinders attached to their framing in connection with the other usual appliances, so that each truck possesses the power of locomotion when supplied with steam, which is done by a single boiler of large capacity, the steam being conveyed respectively to the truck engines through suitably jointed or flexible pipes, and from them after use, by the same means. The boiler is not supported by or enclosed in a frame; it is carried by two of the engine trucks, the fore part resting upon a ball and socket joint in the centre of the front truck, and the after part upon a suitable carriage placed in the centre of the second truck, provided with lateral supports and liberty to swivel when running on curves. The furnace is necessarily long; the fire-grate surface inclines to the front in order to facilitate the fuel supply, and the lower part slopes with a corresponding incline. The supply of water and fuel is carried by the

engine trucks, which renders the provision of a special tender unnecessary. Arrangements are made for supplying steam simultaneously to all the truck engines, or, according to the required power, to any limited number of them. A brake acting directly on the rails is preferred. The means for moderating speed or stopping the train suddenly, are provided by throttling the exhaust passages, so as to confine the steam more or less in the cylinders.

[Printed, 4*d*. No Drawings.]

1863.

A.D. 1863, January 1.—N° 3.

ALLCROFT, George.—(*Provisional protection only.*)—This invention relates to pressure and vacuum gauges, which are contained in a circular case, fitted with a graduated dial plate, and pointer of the ordinary kind mounted on a fixed central pivot. The centre pinion fixed to the back of the pointer is actuated by a toothed quadrant, which moves on a fixed centre, and from which an arm or tail diverges, and is held by a helical spring for the purpose of steadying the pointer. A piece of metal is fixed to the bottom of the case, wherein is fitted a corrugated steel spring plate of the ordinary kind, which is protected from corrosion by a covering of india-rubber. The short curved end of a horizontal lever, adjusted upon a fulcrum pin, is brought in contact with the centre of the spring plate, and the other end of the lever, by means of a rod, is connected to the quadrant by an adjusting screw. For application to locomotives, it is proposed in constructing pressure or vacuum gauges, so to adapt inside the case a syphon or curved thermometer, that its indications shall be visible outside.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 1.—N° 5.

SMITH, John Thomas.—(*Provisional protection only.*)—This invention relates to a mode of obtaining motive power from steam combined with the products of combustion. The furnace and ash-pit are enclosed, and may either be disposed within the boiler or contiguous therewith. Combustion is supported by a current

of compressed air, the reacting power of which must be superior to the resistance of the boiler pressure; a suitable force pump or other machine being used for the purpose. The gaseous and other products combined with the then heated compressed air blast are discharged within the boiler below the water level; the steam thereby generated mixes with the uncondensed gaseous and other products, and is employed to operate a high-pressure steam engine. Before use it may, if thought desirable, be made to pass through a filter. The engine cylinder is by preference either lined with steel, cast in chills, or case hardened. In some cases hollow fire-bars are used, where through the feed water is made to pass in its passage to the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 1.—N° 6.

FAULDS, Robert.—(*Provisional protection only*.)—This invention relates to traction engines, and common road locomotives, and consists in increasing the frictional bite upon the ground by coupling, by means of worms and worm wheels, the two or more pairs of wheels on which the engine is supported. For this purpose, two longitudinal shafts are employed, whereon the worms are mounted; these shafts may be actuated by bevel gearing, by means of a transverse crank shaft worked by the engine, or by spur gearing from a central longitudinal crank shaft. Each trailing wheel is furnished with a worm wheel, upon which respectively the worms on the two shafts, which are driven at a comparatively quick speed, are arranged to operate. "Clutches, "by preference of the frictional kind, are arranged in convenient "positions for throwing the wheels on either side into or out of "gear, and the engine or carriage can be steered or manœuvered "by these means, as the driving of the wheels on one side only "will cause it to turn towards the opposite side. Or the steering "may be effected by means of a separate pair of wheels upon a "bogie or swivelling frame, in connection with which provision "may be made for causing the load to bear more or less upon "them." Instead of worms and worm wheels, spur or bevel gearing may be used, and separate clutches employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 2.—N° 13.

BAKEWELL, Frederick Collier.—(*A communication from Augustus Theodore Schmidt*.)—"Improvements in apparatus for

" burning oils and other inflammable fluids as fuel." "To " effect this object the oil is burned on the surface of water, " through which it is supplied from an enclosed reservoir." The vessel in which the oil is burnt "is supplied with water through a " pipe leading from a separate reservoir." "The pipe through " which the oil is supplied rises a few inches above the bottom of " the fire-box, and a cover placed over the opening of the pipe at a " little distance from it distributes the oil as it rises to the surface." In order to admit the air necessary for combustion, the fire-grate " may be constructed in compartments connected together, or air " pipes may pass through the fluids." In furnaces which are not stationary—such as steam boiler furnaces of marine engines or locomotive engines—the apparatus is hung on gimbals, "and the " splashing over of the oil is further prevented by ledges project- " ing internally from the sides" of the vessel in which it is burnt.

[Printed, 8*d*. Drawing.]

A.D. 1863, January 3.—N° 23.

JONES, Harry.—(*Provisional protection only.*)—The object of this invention, which relates (1st) to those non-condensing steam engines whence the blast of the exhaust steam is employed to increase the air draught through the furnace, is so to arrange the blast pipe that the effect of the blast may be increased or diminished as required. For this purpose, to the blast pipe (which as usual is fitted to direct the blast up the chimney) is added an extra top length, which is fitted and caused to slide up and down upon the lower part by means of a rack and pinion, or other device under the control of the engine driver, the strength of the blast diminishing according as, by raising the sliding part, the steam is made to issue nearer to the top of the chimney, or, when the full blast is required, the upper or sliding part of the pipe is lowered and the blast caused to issue direct from the end of the lower part.

2nd, consists in connecting by means of side rods or bars, the axle boxes on each side respectively of traction engines, for the purpose of distributing or equalizing the strain.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 5.—N° 37.

BESSEMER, Henry.—This invention relates to "the construc- " tion and mode of working apparatus to be employed in press-

" ing, moulding, shaping, embossing, crushing, shearing, and " cutting metallic and other substances."

The apparatus consists of an hydraulic press, continuous reciprocating motion being imparted to the ram or pressing surface, by a plunger and pump in conjunction with a steam engine; the ram moving a limited and regular distance, is assisted at the point of greatest resistance by the momentum or power accumulated in a heavy fly wheel during the inoperative part of the stroke or movement of the ram. The pump barrel, in which the plunger works, is simply a pipe of uniform diameter without valves. The communicating chamber between the plunger and the ram is filled with water, and the reciprocations of the latter regulated according to the relative proportions given to the respective areas of the plunger and the ram. Valves or cocks under the control of the workman are operated by him for the purpose of increasing or diminishing the quantity of water in the communicating chamber, so that a variable level to suit masses of greater or lesser magnitude, and means to moderate the force of the blow are thereby obtained, the additional water being supplied under pressure from a suitable reservoir. In some instances the ram has an upward movement when operating, and in other arrangements it operates at the end of the down stroke by means of a sliding frame, the return stroke in the latter case being effected by the aid of a piston in a second cylinder, placed above the pressing cylinder, so that by means of a connecting rod the ram is raised. Other devices are resorted to for raising the ram, and for some purposes it is made to operate horizontally. Various modifications to suit different processes are described and illustrated. In some cases two pistons acting simultaneously on one crosshead or pressing frame are employed; sometimes two or more rams acting independently or simultaneously are fitted to one press, and two or more presses may be combined with one steam engine.

[Printed, 3*s*. 4*d*. Drawings.]

A.D. 1863, January 5.—N° 38.

CHAMBERLAIN, Humphrey. — This invention relates to generating and condensing steam, and evaporating liquids. The inventor states:—" In generating steam . . . I cause a fine " spray of hot water mingled with a small proportion of steam to

"be directed between the convolutions of one or more coils of "hot-water pipes contained within the generator, such hot-water "pipes being connected to coils of similar hot-water pipes con-"tained in a suitable heating chamber or furnace, and give out "their heat to the spray and convert it wholly into steam. This "steam is collected in a steam chest or chamber inside the gene-"rator, and passes off by a steam pipe for use in the ordinary "manner. A constant circulation of water is maintained through "the heating coils in the generator and in the heating chamber "or furnace by the aid of a centrifugal pump or other water-"forcing apparatus. In order to maintain as even and un-"variable a temperature as possible round the coils inside the "furnace or heating chamber, I propose to fill in the vacant "spaces between the several coils and their convolutions of pipes "with broken or whole fire-bricks, tiles, or, which I prefer, fire-"clay balls, so placed as not to obstruct the draught, but to act "as magazines or stores of heat when the heat is in excess, and "to give out that heat to the coils when the fire gets low, there-"by equalizing the temperature. One or more of the coils in "the heating chamber are connected to a separate feed pipe in "communication with a force pump, injector, or other suitable "contrivance, which keeps up a constant supply of feed water "to these particular coils. This feed water by the time it has "circulated through the special coils in the furnace attains a "considerably elevated temperature, and then passes off by "another pipe to a pipe in the centre of the generator opening "into a valve box which contains a valve seated upon the pipe. "So soon as the highly heated feed water passes the valve, a "portion of it instantly flashes into steam, which steam with the "water is conducted by branch pipes to a perforated pipe sur-"rounding the interior of the generator, and situate above the "heating coils therein, and directs its jet of spray or steam and "hot water on to and amongst the heating coils, the result being "the generation of steam."

Several modifications of the apparatus, to suit other applications of the invention, are shown and described. These comprise apparatus for evaporating liquids, concentrating brine in the manufacture of salt, and for surface condensing steam, which is effected by a similar arrangement of apparatus, cold water being caused to circulate through the convoluted coils and pipes in lieu of the hot water, and the steam is discharged amongst them from a

similar pipe to that which in the generator directs the jet of steam and spray or hot water on to and amongst the heating coils.

It is also proposed to employ coils of pipe each containing a smaller pipe, which for the purpose of being kept in the centre of the outside pipe or coil, is spirally covered with wire, which transversely fills the interspace between the pipes, but does not impede therein the passage of the steam, the cold condensing water passing through the inner pipe and also submerging the outer coil. It is also proposed to employ this kind of apparatus for generating steam.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, January 9.—N° 71.

PUNSHON, JOHN.—(*Provisional protection only.*)—This is an invention of apparatus for preventing overwinding at collieries, and providing additional break power to steam engines. The engine employed consists of two upright steam cylinders, the connecting rods whereof actuate a horizontal crank shaft, the throws of which are set, in relation to each other, at right angles. One of these is the working cylinder, and with the aid of a fly wheel performs the winding up of the mineral to the surface. The other cylinder, although working the same way, receives the steam on the other side of the piston, and serves as a counterpoise to balance the engine. The valve which cuts off the steam from the working cylinder admits the steam to the counter cylinder. The throttle valve is operated by an excentric, as also the slide valve of the working cylinder. The counter cylinder valve has two steam ports and no exhaust, and it is so arranged that the steam each stroke is driven back into the boiler; this valve is also operated by an excentric.

"When the weight or cage gets past the midway of the pit, its " application to stationary winding engines will be, that the " steam in the counter cylinder will balance the additional weight " of the descending rope, and the loss of weight in the ascend- " ing rope, thereby causing the engine to run the whole journey " with a uniform motion, and at the end of the journey to offer " such resistance by pressure in the counter cylinder that " overwinding will be prevented. And by farther arrangement " the counter cylinder can be made to assist the working cylinder " to the midway of the pit, and so double the power of the " engine."

[Printed, 8*d*. Drawing.]

A.D. 1863, January 12.—N° 99.

NEWTON, William Edward.—(*A communication from Perry Dickson and William Ashley Jones.*)—This invention relates to a mode of transmitting rotary motion to a wheel from a steam engine, which motion may be either intermittent or continuous in either direction, and variable in relation to the length of stroke of the piston rod, the end of which, as applied to a locomotive, is jointed to the lower end of a pendent lever, which is caused to swing to and fro by the motions of the piston rod. Upon this lever there is a movable joint, which is made to slide up and down by means of a rack and pinion. A connecting rod united to the movable joint gives motion to a rocking shaft, whereon is fixed a lever, the ends of which, by means of connecting rods, give reciprocating motion to two levers placed on the driving wheel axle, respectively within the side of each wheel. The ends of these axle levers are furnished with dogs, jointed thereon to act by divergent pressure alternately against the inside of the rim of each wheel, so that when the levers are in motion, the dog on the corresponding end of either one or other lever, is forcing the wheel a portion of a revolution, and so acting by turns that continuous motion is kept up. The length of action is regulated according to the fixed position for the time being of the movable joint upon the pendent lever, irrespective of the length of motion of the piston rod, which remains unaltered, the power increasing or diminishing inversely to the speed.

[Printed, 6*d*. Drawing.]

A.D. 1863, January 13.—N° 106.

TOWNSEND, Charles Henry, and YOUNG, James.—This invention relates to compositions of vegetable matters to be used in steam boilers and condensers, for the purpose of preventing incrustation and corrosion. Three compositions are given; No. 1 consists of valonia, bark of the cork tree, and shumac; No. 2 of valonia and bark of the cork tree; and No. 3 of bark of the cork tree and shumac. The relative proportions of the ingredients forming the above three compositions may be varied according to the nature and degree of impurity of the feed water. The following have been found to answer for most waters, excepting salt *water*:—No. 1, valonia 20 parts, bark of the cork tree 10 parts

and shumac 1 part. No 2, valonia 18 parts, bark of the cork tree 6 parts. No. 3, bark of the cork tree and shumac in equal parts. The valonia and the bark are ground and mixed with the shumac, and either introduced into the boiler in a dry state, or the ingredients, after being ground, are boiled together, and the decoction obtained therefrom is used in the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 14.—N° 125.

WILKINSON, Thomas.—This invention relates to the construction of tubular steam boilers, in respect to the mode of preparing the fire-box tube plates and other parts of the furnace. Instead of as heretofore perforating the tube plates with drills or otherwise, whereby the metal is cut out from the plate where the holes are formed to receive the tubes, according to this invention, the plates are first heated to a white heat, and while in that state are perforated by pointed punches, which press the metal, displaced by the operation, into a suitable mould or die plate, strongly supported to resist the necessary force with which the punches operate, whereby short tubular projections are formed at the back of the tube plate around each hole; a sufficient number of punches are employed with a corresponding die plate, to drive all the holes at a single operation, the rivetting flange being formed round the plate at the same time. The operation is performed by a screw or other suitable press. The holes in the back tube plate are made in the ordinary way of sufficient size to allow the tubes to slide through and be screwed upon the corresponding short tubular projection, which has been formed by the operation upon the back of the front plate; a nut or collar on the back end of the tube, which projects beyond the back tube plate, is screwed up to face against it, and so form a steam-tight joint. The sides of the fire-box are punched in the same way, and short tubes projected to receive tubular stays; a flange by the same means is projected around the fire-door opening, in the front plate of the fire-box, which is also at the same time, while in a heated state, flanged round by pressure between suitable moulds. The bottom edge plate is flanged and attached by bolts and nuts, for the purpose of easy removal when required. When the fire-box is constructed with plates cast in suitable alloys of copper, the short tubular projections and the flanges are cast in the same moulds.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 20.—N° 166.

PAUL, ALFRED.—(*Provisional protection only.*)—This is an invention of a steam engine, whereby, when rotary motion is not required, reciprocating motion is obtained without the aid of the crank, fly wheel, and excentrics usually employed.

It consists in the use of a compound slot link of wrought iron, brass, or other suitable material. This link oscillates on a fixed centre, and contains two slots, the longest of which extends beyond the length of stroke of the engine, so that a tappet arm attached to the piston rod, will travel to and fro through its whole length without coming into contact with the ends of the slot. The sides of the slot are so curved out of a direct line, that the arm as it traverses to and fro with the piston rod, causes a corresponding reciprocation of the link. The lesser slot operates the side valve, and thereby maintains the successive motions of the piston. An adaptation of the motion thus obtained, is described as applied to the working of pumps, for the purpose of draining mines.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 22.—N° 201.

CLARK, WILLIAM.—(*A communication from Thomas Shrimton Davis.*)—This invention relates to piston valves and pistons. "It consists in the construction of such a valve or of any piston "with an expanding ring, having the head and follower fitted to "its interior, and with a dovetail wedge so applied in connection "with the ring head and follower as to make the valve or piston "as much like a solid block as is desirable, yet capable of being "set out to fit the cylinder in which it works and compensate for "wear." A screw fitted with a set-nut is provided for the convenient adjustment of the wedge. When piston valves are applied to steam engines, a cylindrical seating is provided within the steam chest, no alteration being required in the induction and eduction ports. A valve is fitted to each induction port; these valves, in relation to the steam pressure, act in equilibrio, as the outer ends of both valves are exposed to the pressure of the steam in the chest, and the adjacent ends to the exhaust and to the atmosphere, and by sinking annular grooves in the seat of the casing corresponding with the width of the induction ports, they

are balanced in all directions. Both valves are placed on one valve spindle.

[Printed, 10*d*. Drawings.]

A.D. 1863, January 22.—N° 205.

MORLEY, Francis William.—(*Provisional protection only.*) —This invention relates to steam boilers, and to a regulating steam valve. As regards boilers (which may be of any ordinary kind) it consists in the use of a series of copper tubes arranged to form the grate-bar surface, in lieu of the fire-bars in common use. These tubes are so arranged in communication with the water in the boiler, that a constant circulation is kept up, the supply coming from the lowest level of the water space in the boiler to follow the heated water as it rises through the tubes, and enters the boiler above. It is also proposed to insert a number of fire or hot vapour tubes into the lower section of the boiler, and so form a communication with the upper section; these tubes are to extend in front, so as to reach over the fire, and thereby increase the heating surface. The valve for regulating the steam supply to the engine, consists of a disc, which has reciprocating rotative action on a fixed central steel pivot, the height of which can be regulated to sustain the weight of steam pressure, and thus reduce the friction between the face of the disc and the cylinder valve-surface, wherein are sunk the inlet and exhaust passages, which according to the relative positions of two triangular slots through the disc, are as the disc moves on its centre, alternately brought more or less coincident therewith, or covered by the plain surface of the disc, to which the necessary motion is given by an excentric on the engine shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 23.—N° 206.

MILNER, John.—This invention relates to the slide valves of such compound steam engines as have their cylinders proximately arranged, with a valve box interposed between them; the valve facings of the two cylinders presenting (according to one arrangement) planes parallel with each other; the back of each valve is planed true and parallel with its face, and works in contact with an intervening passage plate, which fills the space between the two valves; this plate is not a fixture, but has neither lateral nor

longitudinal motion, fitting easily between suitable projections at the ends and sides of the valve box; it has four steam ways or passages through it corresponding with the valve ports and slides, the movements of which are so arranged that each slide not only admits and discharges steam to and from its own cylinder, but by itself or its connections, cuts off the steam entering into the other cylinder at such part of the stroke of each piston as may be desired. The valve box is filled with high-pressure steam, which (when all correspond in position) passes through the passage plate and the high-pressure slide valve, into the high-pressure cylinder ports, the induction opening through the passage plate being uncovered by the movements of the low-pressure slide valve, whilst the high-pressure slide valve operates to cut off the steam and regulate the exhaust, which takes place through the high-pressure valve and passage plate, when the low-pressure valve is in position to correspond. For the purpose of securing steam-tight working surfaces, the valves may be made in two parts. Arrangements are described and exhibited, wherein the valve surfaces of the cylinders are placed (in relation to each other) at an angle; the front and back surfaces of the valves are parallel with each other, but the intervening passage piece is shaped in conformity with the angles of the cylinder surfaces, as presented to each other. This arrangement mantains steam-tight meeting surfaces between the passage piece and the backs of the valves. The cut-off is regulated by the use of a link motion. Further modifications are shown and described.

[Printed, 2s. Drawings.]

A.D. 1863 January 24.—N° 216.

MELLOR, William, and WHALEY, William.—This invention relates to a mode of actuating the slide valves of steam hammers and other steam engines "by means of a screw which "passes through a nut formed in the piston, so that as the piston "moves up and down or to and fro in the cylinder the screw is "turned round in opposite directions. This screw is made of "the same piece or attached to another screw acting on a nut "connected to the lever to which the valve spindle is jointed; by "this means the slide valve is moved to and fro to open and "close the steam ports in the valve box." The invention also "consists in connecting the valve lever to a rod acted upon by

" levers and rods for the purpose of varying the position of the " fulcrum of the lever, so as to increase or diminish the length " and force of the stroke." The arrangements " may be modified " by placing the screws to one side of the piston rod; in this " case one of the screw nuts is connected to a projection on the " hammer head and the other is connected to the valve spindle."

[Printed, 1s. 4d. Drawings.]

A.D. 1863, January 26.—N° 227.

FELL, JOHN BARRACLOUGH.—This invention relates to a mode and apparatus for working railway trains and engines up and down steep inclines, by means of one or more pairs or sets of horizontal adhesion wheels, which are, by suitable means, made to impinge laterally, in the direction of each other, against the sides respectively of a central rail, longitudinally fixed midway between the ordinary travelling rails of the road; these wheels are fixed on short vertical crank shafts, mounted in coupled bearing blocks which slide laterally in fixed transverse guides; they are actuated by connecting rods attached to the piston rods of two additional cylinders. The necessary amount of adhesion is obtained by means of a transverse shaft, furnished with a right and left-handed screw, and made to revolve by bevel gearing; upon each end of this screw shaft is mounted a strong curved laminated spring, the ends of which by means of the screw are caused to press upon the axles and so force the wheels to close upon the central rail. The arrangements for applying the invention are to be varied and modified to suit engines of different construction. The steam cylinders which operate the apparatus, may be either horizontally or vertically disposed. Instead of curved laminated springs, strong volute springs may be substituted, and the operations of the bevel gearing and the right and left-handed screw shaft, may be effected by eccentrics. The crank arms of the vertical shafts which carry the adhesion wheels, are coupled by connecting rods. The apparatus may be applied to the tender or other part of the train. When descending inclines it is made to act as a brake.

[Printed, 1s. 4d. Drawings.]

A.D. 1863, January 26.—N° 229.

FYFE, JAMES.—(*Provisional protection only.*)—This invention relates to safety apparatus adapted to steam boilers, and consists

of a rectangular or other formed vessel, so disposed outside the boiler, that the water level shall rise to about its mid-height, communication being open between the bottom of the vessel and the boiler below the water level, and between the upper part of the vessel and the steam space of the boiler by means of suitable pipes and stop valves. Fitted to the front of the vessel, there is a glass water gauge, and above the water line, a pressure gauge of any convenient kind; also upon the top of the vessel there is an alarm steam whistle of ordinary construction. The water inlet pipe at the bottom of the vessel, is closed by a valve suspended from a float; attached to and rising above the float there is a rod, shaped at its upper end to close the opening communicating with the alarum above; this rod is jointed to one end of a lever which centres on a fixed stud projecting from the side of the vessel, and supports (suspended therefrom in the steam space) another float at the opposite end. If the water level sinks too low, the alarm valve is opened by the descent of the lower float, and if too high, it is opened by the rising of the upper float. A safety valve loaded to the maximum pressure, blows off through the alarum and sounds the whistle, which may also be sounded at any time by means of the water gauge blow off cock.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 28.—N° 250.

MACE, CHARLES.—This invention relates to a particular arrangement of the cylinders and parts of direct-acting marine engines in combination with a surface condenser contained in the engine bed, which is made hollow and of suitable form and size, to receive an arrangement of slightly inclining horizontal tubes, disposed therein on a line with the keel. The steam cylinders are inverted and superposed on hollow castings or columns, which stand, fixed to the hollow bed, on each side of the crank shaft bearings. Each cylinder piston has two piston rods which work out through stuffing boxes at each end of the cylinders; the lower ends of the piston rods are fixed to the main crosshead respectively on each side of the centre, whereto the upper end of the main connecting rod is jointed; the ends of this crosshead are furnished with slide blocks which work in guides attached to the hollow columns, whereon the cylinders rest. The lower end of the connecting rod is coupled to the crank shaft below. The

upper ends of the piston rods are fixed into and carry another crosshead, the ends of which extend diametrally on each side, beyond the width of the cylinder, and work the pump rods which clear the cylinder sides; these rods enter the hollow columns through stuffing boxes, and extend downwards to the engine bed, where the pumps are located. The engine bed condensing chambers are connected by cross beams which carry the crank shaft bearings. The exhaust steam passes down the hollow columns, and by means of perforated distributing plates, is sufficiently diffused in the condensers. The foot valves of the air pumps and the delivery valves are conveniently arranged. The down strokes of the pumps draw the water from the condensers, and the up strokes close the suction valves, and force the water through the delivery valves, and thence into the sea. An ordinary injection apparatus is furnished to the condenser, for use in case of need. The engines are applicable to all purposes. The invention includes a mode of fixing the ends of tubes into tubes plates.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1863, January 28.—N° 252.

WYMER, Francis William.—This invention relates to the construction of high and low-pressure steam engines. Three arrangements are shown. The first described exhibits a high-pressure cylinder of small diameter superposed centrally upon a large low-pressure cylinder. The high-pressure piston rod carries a crosshead, to the ends of which the low-pressure piston rods are attached; these two rods are diametrally disposed, sufficiently far apart from the centre of their piston, to clear the outside of the high-pressure cylinder; their lower ends pass out of the bottom of the cylinder through stuffing boxes, and are fixed to the ends of a crosshead, which slides between guides attached to the framing, and to which the connecting rod (coupled to the crank shaft below) is jointed. The frame whereon the cylinders are mounted is hollow, suitably formed and internally furnished to receive the exhaust steam from the low-pressure cylinder, and dispose of it either by surface or injection condensing. The air and water pumps (driven by means of a lever from the lower crosshead) are fixed to a suitable foundation or bed plate, outside the hollow framing, which is also bolted thereto. The steam at high pressure first operates in the high-pressure cylinder, which exhausts through suitably arranged passages into the low-pressure cylinder,

passing thence into the hollow supporting frame, where it is condensed. In another example, the conjoined cylinders are inverted, and disposed beside each other. The piston rods operate a beam, which is supported in bearings attached to the hollow framing, and the connecting rod gives motion to the crank shaft from the other end of the beam. Other arrangements describe the cylinders horizontally disposed, as designed for marine propulsion. The valves are of the ordinary kind, actuated by eccentrics on the crank shaft, and fitted with reversing gear.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, January 28.—N° 253.

PLATT, James.—This invention relates to rotary engines, adapted to operate with steam or other fluid. A cylinder mounted upon a shaft, is disposed within a cylindrical case, which carries the shaft bearings, and acts as the framing of the engine, being suitably fixed and constantly filled with steam. Two hollow chambers in diametral relation to the axis, are formed at one end of the cylinder to receive two slides, which are alternately moved in and out by a fixed excentric cam track, in which rollers connected to the slides make a circuit, and operate the slides in conformity with motion given to them by the eccentricity of the track in the cam, which is fixed to a hollow trunk abutting against one end of the cylinder, and divided into two compartments, one for the admission of the steam, and the other for the outlet. Fixed in the end of the trunk is a steam repressor stop, between which and each slide alternately, the expansive force of the steam operates, and so compels the cylinder and shaft to rotate; the steam stop is packed with metallic packings, formed with inclined surfaces, and adjustable by means of a screw. When required to reverse the direction of motion, the steam, by means of a suitable valve, is made to enter through the exhaust passage, and is discharged through the inlet. The engine may be converted into a pump, if the shaft be caused to revolve by other motive power.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1863, January 28.—N° 258.

STEWART, Charles Patrick, and ROBINSON, John.—This invention relates to "Improvements in and applicable to

" that apparatus known as Giffard's Injector " and in the adaptation of it to locomotive and other boilers. The inventors state, that certain alleged objections to the use of Giffard's injector are remedied by their discovery, which consists in forming a closed cavity around and above the nozzles of the injector of sufficient size to contain all the water which for the moment may overflow when starting the injector or otherwise, which water is sucked up immediately after. Also, in order to prevent loss of water, applying a pipe to the overflow orifice, so that the water therefrom will have to ascend towards the open end, or the pipe may be bent down and the end submerged in water and so prevent the admission of air. The invention also consists in connecting the overflow orifice with the suction supply pipe, and interposing a two-way, or two separate taps, between the overflow and suction pipes, so that when the communication is closed the overflow will be open to the atmosphere, and when shut to the atmosphere it will be open to the suction pipe. Also, in so applying the injector to locomotive and other boilers, that the working of the apparatus will be more open and easy of inspection, which consists in connecting the overflow orifice with the suction pipe, interposing a tap for opening and closing communication between them, and in joining a branch pipe to ascend from the connecting pipe and be open at top to the atmosphere. Other arrangements for this purpose are described.

[Printed, 10*d*. Drawing.]

A.D. 1863, January 29.—N° 274.

CLARK, William.—(*A communication from Amédée Mathurin Gabriel Sébillot.*)—This invention relates to a mode and apparatus for condensing steam, otherwise than by injecting cold water, in order that distilled water may be obtained for supplying the boilers. The condensing water is projected on to one surface of a thin medium, the opposite side of which is in contact with the steam, after the manner of surface condensing. The distilled water is separated from the fatty matters which are comminuted and mingled with the steam. Various arrangements of apparatus are shown and described, consisting of cylindrical and other formed casings, wherein thin metal tubes are disposed in groups or otherwise, inclining somewhat from a horizontal position in order to facilitate the drainage of the condensing water from the tubes. The exhaust steam is admitted into the body of the con-

denser case between the tubes, and is condensed by contact with their external surface, which is always kept cool by the injection within them of cold water, introduced by means of suitable pipes. The distilled water produced by condensation falls in rainy particles into a lower chamber or space, and thence is impelled by the air pump towards and into a reservoir where, by means of a perforated plate and an under bed or stratum of flock or material capable of absorbing oily matters, it is separated by filtration therefrom, to be afterwards supplied by the feed pump to the boiler, in a comparatively pure state. A mode of cleansing the tubes (if necessary while the apparatus is in operation or otherwise) forms part of the invention, as well as an arrangment for replenishing that portion of the steam which is lost by leakage or otherwise.

[Printed, 2*s*. Drawings.]

A.D. 1863, January 31.—N° 291. (* *)

WILSON, Edward Brown.—(*Provisional protection only.*)—" Improvements in supplying air, gases, steam, or fluids to iron " and other furnaces, and to engines and vessels requiring such " supply, and in the apparatus employed therein." Apparatus constructed on the principle of " Giffard's injector," as described in the Specification of Letters Patent dated July 23, 1858, numbered 1665, is proposed to be used for supplying air, gases, or steam to furnaces. The "jet pipe which may be of an an- " nular or other form is enclosed in an air chamber, which is con- " tracted in front of the nozzle, and provided if desired with a " regulating plug," or other suitable apparatus. A branch pipe or syphon is attached to the side of the air chamber, through which the air, gases, or steam may be introduced into the chamber. The apparatus may be used in furnaces for manufacturing iron or steel instead of using ordinary blast apparatus, also for ventilating purposes and supplying hydraulic presses.

[Printed, 4*d*. No Drawings.]

A.D. 1863, February 3.—N° 304.

FLETCHER, Joseph, and BOWER, Henry.—This invention relating to an apparatus for injecting feed water into boilers by the impulse of steam, consists of a pipe coiled spirally round a *central* tube, one end of which communicates with the steam dome

of the boiler, and the other end terminates in a tapering nozzle concentrically disposed within the open apex of a conical water chamber, to which the spiral pipe leads, its other end uniting with the water supply. When the steam is admitted to the central pipe, and the feed water to the circumambient coil, the force of the steam issue from the nozzle, sucks or draws the water (which is heated on its passage through the coil) out of the annular apex of the conical chamber; the constant current of the escaping steam attaches the water, which is carried and forced thereby into an injection chamber and thence through the feed pipe into the boiler. The apparatus, it is stated, can, with slight modifications and adaptation of the necessary parts, be applied to boilers generally, and may also be used as a force-pump on ship board, in distilleries, and other places, without the mechanism of an engine to operate it; the relative proportions of the steam and water supplied to the respective channels, being regulated by suitable taps or valves.

[Printed, 8*d*. Drawing.]

A.D. 1863, February 9.—N° 356. (* *)

MACINTOSH, John.—(*Provisional protection only.*)—"Im-"provements in obtaining and applying motive power." Fuel "composed either of collodion, coke, coal, wood, nitrate of "soda, or coke and nitrate of potash," or sulphur, or chloride of potash, combined with pitch, resins, paraffine, gutta percha, caoutchouc, or glue is burnt, and the gases evolved "may be used "alone or in combination with steam" or air for driving machinery. It may also be employed in boiler furnaces for rapidly raising steam.

[Printed, 4*d*. No Drawings.]

A.D. 1863, February 9.—N° 357.

LAW, David, and DOWNIE, John.—This invention relates to the construction of traction and common road locomotive steam engines, and to the steering and manœuvring of such engines, which is effected by more or less inclining the axles of the driving wheels, so that when operating to change the direction of motion, they are made to deviate from their normal parallel position and assume respectively, in relation to each other, angles more or less acute. Each engine has two pairs of driving wheels; upon each of the axles, mounted on springs, is a kind of "bogie" these

support the main carriage framing and are capable of swivelling, in accordance with the steering action, without effecting the transmission of power through the wheels. The swivelling movement is effected by means of toothed segments fixed to the "bogies" acted upon with worm wheels by means of a hand wheel mounted upon a standard, the two worm shafts being connected by intermediate shafts and pairs of bevels. Various arrangements of steam boiler and engine details are or may be provided. In one arrangement a vertical multitubular boiler is employed, which may be suspended on trunnions so as to maintain an upright position when the engine is ascending and descending inclines. The boiler is placed between the "bogies" and their vertical driving shafts, and rests upon suitable brackets fixed to the main framing. There are two cylinders disposed respectively on each side of the boiler. The piston rods pass through the cylinders, and drive crank shafts from each end. Friction brakes arranged to act simultaneously on all the wheels are provided. The ordinary link motion is adopted for operating the valves by means of eccentrics, which are mounted on one crank shaft, and other eccentrics are mounted on the other crank shaft for working the feed pumps. It is intended to employ the chimney blast, and in addition, in order to suppress the sound and appearance of white vapour outside, to provide for exhausting the cylinders into the water tank through a box fitted with diaphragms of wire gauze, and into which also the feed water is directed when the connection with the boiler is closed. Air is also made to pass through tubes arranged across the feed tank, which communicate with the ash-pit and fire-box, whereto the air is conducted by means of a belt, which encircles the boiler above the grate bars. Various other operative suggestions are made.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1863, February 9.—N° 358. (* *)

GOUCHER, JOHN.—"Regulating the admission of air into the "furnaces of steam boilers" through the furnace door. A spring or a weighted piston acted upon by steam from the boiler is so connected with either a valve or a damper fitted to the fire-door, that when a given pressure is exceeded, air is admitted through the door.

[Printed, 10*d*. Drawing.]

A.D. 1863, February 13.—N° 389.

SPENCER, JOHN FREDERICK. — This invention relates to arranging and disposing the parts of steam engines combined with surface condensers. Two arrangements are described; the first has reference to the convenient working of the air and cold water pumps, and is a suitable design under circumstances where the crank shaft is required near the ground level. The condenser case is fixed between the foundation frames, and is of sufficient strength to form the support of the cylinder, which is fixed horizontally upon it, and fitted with a trunk piston. The connecting rod is jointed to the top end of an oscillating vertical lever, which vibrates on a fixed centre at its lower end; the crank connecting rod is jointed to the lever at a point a short distance below the other connecting rod, so that the throw of the crank is somewhat shorter than the stroke of the piston. The hot well, and combined air and cold water pump, are horizontally disposed below the condenser and bolted thereto. The combined pump is fitted with a single trunk piston wherein the pump connecting rod is jointed; the outer end being jointed to the vibrating lever, at about its mid-length, so that the stroke of the pump is about one-half the length of the stroke of the piston. The feed water pump may be similarly disposed, and operated in the same manner. The condenser is of the surface condensing class, containing a multitubular arrangement of horizontal tubes, with separate current chambers for water and steam. The other modification exhibits a single cylinder engine with vertical action, fitted with a piston and rod of the ordinary kind; the piston head block, to which the connecting rod is jointed, is arranged to work between vertical guides attached to the framing, which extends upwards and carries the crank shaft above. The combined air and cold water pump is disposed beneath the steam cylinder and is worked by a downward rod attached to the steam piston, passing out through a stuffing box in the cylinder bottom. The condenser case is disposed below the ground level on chambered legs, and partly constitutes the foundation; one leg answers to the hot well, and the other as an air vessel to the cold water pump.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, February 17.—N° 437. (* *)

TASSIN, DESIRÉ.—"Improvements in preventing the explosion "of steam boilers."

"It is known that explosions usually occur when the steam "engines are at rest, and when the steam may be said to be at a "mean pressure in the boilers, that is to say, when the stone "float can sway or move freely at the least bubbling of the water. "Now it should be stated that I have ascertained that it is elec-"tricity which causes the explosions of steam boilers. The stone "float of a steam boiler has through its centre an iron clasp, sus-"pended on a copper wire. When the water contained in a "boiler happens to be more or less impregnated with acid or "alkali, the least movement which takes place in the float causes "a shock or friction between the two different metals (iron and "copper) that are in contact, and the electric spark is produced "at their point of junction, and thence comes the explosion. "My invention consists in preventing these electric sparks, and "consequently the explosions of steam boilers by electricity in the "following manner: In place of employing two metals to the stone "float, I only use one metal, both for the clasp and for the sus-"pending of the float, for which reason the clasp as well as the "wire which suspends or sustains the stone float I make of cop-"per; by thus using only one metal the same will not be capable "of emitting electric sparks under the circumstances above-men-"tioned, and electric explosions will be thus prevented."

[Printed, 6d. Drawing.]

A.D. 1863, February 18.—N° 442.

SPENCER, John Frederick.—This invention relating to "apparatus for regulating and working the valves of steam and "other engines" is only applicable in those cases where the operating of the valve or valves for regulating the admission or suppression of the steam is separate and distinct from the motion of the exhausting valve. In engines, for reversing gear, two links with an intervening packing, are placed side by side, and connected together so as to form a double link, to the ends of which respectively (jointed between them) are attached the rods of two eccentrics. There is a sliding block in each link, connected, one to the exhaust valve rod, and the other to the rod of the expansion or steam slide; the movement of the former will reverse the exhaust valve, and by moving the latter, the steam valve can be reversed and the expansion varied without any joint or mutual interference, so that the expansion can be altered in one link,

without effecting the exhaust in the other; thus the advantages of the link motion are secured as affording a variable expansion without its usual disadvantage of altering injuriously at such time, the action of the exhaust; two eccentrics only being required. In stationary engines requiring no reverse of motion, two eccentrics and rods are employed with one link, to one end of which the exhaust valve rod is connected, and the steam or expansion valve for varying the cut-off is connected to the sliding block.

[Printed, 8*d*. Drawing.]

A.D. 1863, February 20.—N° 469.

BENNDORF, Friederich William.—(*Provisional protection only*.)—This invention relates to governors or apparatus for regulating the speed of steam and other engines, and consists in the employment of an arm made to vibrate coincident with each revolution of the engine, so that the number of vibrations of the arm correspond with the number of revolutions of the crank shaft. Swinging in conjunction with the arm is a pendulum, which keeps time in unison therewith whilst the engine is running at its proper speed, neither is there any action upon the throttle valve; but directly, in consequence of an acceleration or diminution of speed of the engine taking place, and the motions of the vibrating arm get in advance or later than the motions of the pendulum, pawl catches attached thereto one under and the other over the centre, act upon a sliding piece which operates upon the throttle valve by means of a rod in one or other direction respectively, so as to increase or diminish adversely the supply of steam to the cylinder. It is preferred that the arm and the pendulum be mounted together on one axis.

[Printed, 4*d*. No Drawings.]

A.D. 1863, February 21.—N° 482.

DUGDALE, Anthony.—This relates to a mechanical arrangement for actuating throttle valves, otherwise than direct from the governor, and consists, in so mounting the valve that the pin on which it centres or turns shall be entirely independent of the actuating parts, and only serve as a pivot for the valve to turn upon, the intermediary parts, which transmit the movements of the regulator, being connected to one extremity or wing of the valve, and not as usual to the valve spindle. The valve turns

upon a fixed pin or rod which passes diametrally through its centre, intersecting the centre of the steam pipe and passing out at opposite sides; a short distance from the valve, a small shaft is laterally introduced through a stuffing box into the steam pipe on the same plane and parallel with the valve pin; upon the mid-length of this shaft, within the pipe, is mouted a short arm, the end of which is attached to one wing of the valve by means of a connecting link jointed at each end. Upon the end of the shaft, outside the stuffing box, is mounted a lever arm, to which is jointed the rod which transmits the regulating movement from the governor. A movable weight is suspended to the lever arm to assist the action of the valve.

[Printed, 8*d*. Drawing.]

A.D. 1863, February 23.—N° 489.

DATICHY, JEAN PIERRE FLORIMOND.—This invention relating to steam engines and to condensing and utilizing emission steam, which when exhausted from the engine cylinder is passed through a condensing apparatus, consisting of groups of tubes, surrounded by either water or air, or by water and air, the latter being forced in between the tubes by a fan or blast, and the water made to trickle down the outer surface of the tubes, is afterwards returned to the supply cistern. The steam, more or less condensed, is afterwards forced by suitable pumps into the boiler, either direct or through a serpentine coil of pipe, disposed in or round the casing of the boiler, at the back of the furnace, or in the smoke box, whereby it becomes heated before entering the boiler. "The " condensers consist of jacketted cylinders, containing within " them another casing in which are tubes, into which tubes the " waste steam from the cylinders is made to enter." Instead of passing the steam through the tubes, it may be directed so as to flow between them, and the water and air be made to find a passage through the tubes.

[Printed, 10*d*. Drawing.]

A.D. 1863, February 24.—N° 507.

WALKER, EDWARD ROSS.—This invention relates to apparatus connected with the slide and other valves of steam and other engines, and which acts to prevent fluid pressure on the back of the valve, by means of a flexible plate connected thereto, which is

arranged to receive pressure in a contrary direction, and so neutralize or diminish the pressure on the valve. The details and arrangements are somewhat varied, according to circumstances. In one form of slide valve, the back has projections upon it to which a short link or connecting rod is jointed; the other end of the rod is jointed to a bolt in the centre of a flexible plate, which forms a cover to the valve box; the bolt passes through the plate and is secured thereto by a nut outside. The outer end of the bolt is furnished with regulating nuts, and passes through a flat spring, supported crosswise on fixed studs a short distance from the outer surface of the flexible cover. When the box is filled with expansive fluid, the pressure on the flexible plate causes it to bulge and yield, and by means of the connecting rod, countervail and sustain the weight or pressure upon the back of the valve, which pressure by means of the regulating nuts, can be reduced to a minimum on the cylinder surface; then a slight effort will operate the valve. The length of the connecting rod bears relation to the undulating action of the plate, which to prevent undue straining is limited to about ⅛th of an inch. Three modifications are shown and described. All these may be further varied by so arranging the steam passages, that the pressure may come on the opposite side of the valve and on the upper side of the plate. The invention is shown as applied to throttle valves, and may be adapted to all kinds of regulating, stop, and other valves, and to all kinds of steam engines and motive power machines.

[Printed, 8*d*. Drawings.]

A.D. 1863, February 24.—N° 509.

HUDDART, George Augustus. — (*Provisional protection only.*)—This invention relates to means for imparting heat to fluids, by the use of which (it is stated) the raising of steam in steam boilers is greatly facilitated, which it is proposed to "effect by partially filling the water space with a good heat-"conducting material, such as solid or hollow pieces of iron of "various shapes, which when thrown into a steam boiler will so "arrange themselves as to form a kind of porous filling that will "not interfere with the circulation of the water, but will occupy "a considerable portion of the water space. By means of this "metallic filling which will lie in contact with the boiler plates "and pipes subjected to the fire of the furnace, heat will be

"rapidly absorbed into the interior of the boiler, and by reason "of the large metallic surface which it will expose to the water, "it will effect the rapid transmission of heat to the water, and "thereby facilitate the conversion of the water into steam."

[Printed, 4d. No Drawings.]

A.D. 1863, February 24.—N° 512.

THOMSON, ROBERT WILLIAM.—This is an invention for obtaining and applying motive power, partly applicable for raising, forcing, and measuring fluids. It "consists of a cylinder or "steam chamber with a horizontal axis, containing within it two "diaphragms or pistons. One of these pistons or diaphragms is "keyed upon a solid shaft passing through the axial line of the "cylinder, whilst the other is similarly keyed upon or attached "to a tubular or hollow shaft, through which the solid shaft is "passed. The hollow or tubular shaft passes out of one end of "the steam cylinder by a stuffing box in the ordinary manner, "and the solid shaft passes through it. Each shaft has keyed "upon it a working crank, and these two cranks have connecting "rods, the opposite ends of which are jointed to the rim of a fly "wheel disposed eccentrically as regards the steam cylinder by "means of suitable joint studs. The positions of the pistons "accord with those of the external cranks, and the actuating "steam is admitted to one side of the pistons or diaphragms, "and discharged on the other by valves of any suitable form. "At the 'dead point' of the engine the two pistons or diaphragms "themselves close the steam cylinder ports. If now the fly "wheel moves round, one piston will pass the induction port and "the other will pass the eduction port, both moving in the same "direction; but when steam enters by the induction port it tends "to cause the two pistons to move in opposite directions; but as "the two pistons are set to revolve upon one main centre, and are "connected by the cranks and connecting rods with the fly "wheel, as herein-before referred to, working upon a separate "and independent centre, it follows that the front or first piston "will increase in velocity, whilst the opposite or second piston "decreases in speed, the steam being introduced between the "two. The result is, that during a complete revolution of the "fly wheel each of the pistons will traverse three-quarters of a "revolution with the actuating steam pressure, and one quarter "of a revolution against it, giving together a working traverse

" equal to one-and-a-half revolutions. During this amount of
" traverse each of the pistons is working through a quarter of
" a revolution against the pressure of the steam, and this being
" deducted from the amount of forward motion, leaves a com-
" plete revolution of the pistons corresponding to that of the fly
" wheel with the pressure of the steam available as power. This
" rotary engine may be so arranged as to dispense with slide
" valves, the pistons being made available to open and shut the
" steam ports at the proper intervals."

Several modifications, adapting the invention to various practical purposes are shown and described.

[Printed, 1s. 6d. Drawings.]

A.D. 1863, February 28.—N° 564.

HADFIELD, William.—This invention relates to steam boilers, and the flues in connection therewith.

The object of the invention, which is applicable to boilers with internal flues, is to impart additional strength, obtain increased internal and external heating surface, and avoid or reduce unequal expansion and contraction. The fire-grate or grates are placed in one or more flues, which conduct the heated gases and products of combustion through lateral openings into external side flues. These flues return towards the front of the boiler, where the hot draughts enter a flue which extends under its whole length and terminates in a chamber at the back, whence the hot draughts, passing upwards, enter internal flues, which after extending towards the front of the boiler for about two-thirds of its length, open into external side flues, which return and unite in the chimney flue at the back. By carefully supplying the fires alternately with fuel, the smoke is partially consumed, and in order to consume it entirely, heated air is admitted at or near the bridges, through pipes which are disposed along the external flues. These pipes are open at their outer ends to the atmosphere; the air becomes heated during its passage through them, and escapes through perforations near the bridges, where it mingles with the products of combustion. Arrangements are also made for bringing the fire draught alternately from the clear incandescent fire into contact with the fuliginous matters evolved by the green fuel in the furnace more recently fed.

Various modifications to suit boilers of different constructions are described and illustrated, and the Specification of a Patent

granted to Richard Pollit, dated 9th July 1860, No. 1644, is referred to.

[Printed, 1s. 10d. Drawings.]

A.D. 1863, February 28.—N° 568.

WILLIAMSON, Stephen.—This is an invention relating to steam boiler and other furnaces. It consists of an arrangement of perforated bricks and air passages, introduced in the construction of furnace bridges beyond the grate bars, for the purpose of promoting combustion and the consumption of smoke, and in order that the cold air admitted may not be brought into direct contact with the heating surfaces of the boiler. It is described as follows:— "There is a bridge immediately beyond the grate bars built "hollow, with an inlet below the grate bars for the admission of "air; this bridge has also two rows of perforations (formed with "bricks made for the purpose) on that side of the bridge farthest "from the fire for the escape of air intended to mingle with the "flame and smoke. At a short distance from the first bridge is "a second hollow bridge, hanging and built close up to the "boiler bottom, with similar perforations facing the former for "giving out the air, which is supplied by pipes on each side con-"necting the air chamber of the second bridge with that of the "first. The amount of air introduced is managed at pleasure "by the opening or closing of a door to the aperture beneath the "grate bars; this door is worked" by means of a small cylinder with a piston and rod placed beneath the mouth plate of the furnace; one end of the cylinder is open, and the other is closed; a valve opens to admit the air, which is let out in regulated quantity by means of a cock; the piston is operated by the movements of the furnace door, by means of a tappet. "Beyond the "second bridge is a third bridge built solid; this serves the "purpose only of conducting the flame against the boiler bottom "as soon as it leaves the second bridge."

The construction of furnaces to suit various purposes is carried out on the same plan, modified to meet the requirements of each particular case.

[Printed, 8d. Drawing.]

A.D. 1863, February 28.—N° 572.

PENN, John.—This invention relates to "improvements in "escape or relief valves to the cylinders of marine and other steam

" engines." Instead of employing weights or springs to keep the valves on their seats against the pressure of steam in the engine cylinders, the valves according to this invention are enclosed in cases and attached to any convenient part of the cylinders, sufficiently high to allow by means of pipes, any water to pass into a separator, disposed in the main steam pipe, or at once into the main steam pipe, if the position of the latter will permit of such an arrangement; a communication is open between the valve casings and the steam pipe, so that the maximum steam pressure is always upon the valves, which are pressed and maintained on their seats, by the difference between the pressure of the steam in the main pipe, and the pressure of the steam in ,the cylinder, and also the difference of area between the under and upper surface of the valves. By this arrangement no strain beyond the boiler pressure, can at any time come upon any part of the machinery in consequence of compression when working expansively, or when the engines are suddenly reversed. These valves cannot be rendered inoperative by overloading, which is frequently done to prevent the escape of steam into the engine room, and there is no loss of steam, as all which passes the valve, returns into the main steam pipe.

[Printed, 1s. 2d. Drawings.]

A.D. 1863, February 28.—N° 574.

HAYES, Edward.—This invention relates to a mode of supplying water to the surface condensers of marine steam engines without the aid of pumps. For this purpose the draft of the propeller is made available to promote the object in view. The supply of condensing water to marine surface condensers requiring a constant current, is obtained from the sea through the vessel's side, by means of pipes opening out below the water line. After the stream has passed through the condenser, it is conducted through suitable pipes towards the stern of the ship, and there, contiguous to the axis of the propeller (by preference underneath it) the discharge takes place. By this arrangement the outflow is brought under the influence of the draught of the screw, which is said to produce a partial vacuum, whereby the speed of the cold current through the condenser and pipes is greatly accelerated, and the use of pumps heretofore employed for the purpose of forcing the current, may be dispensed with.

[Printed, 4d. No Drawings.]

A.D. 1863, March 2.—N° 577. (* .*)

MURRELL, Owen.—"Arrangements for generating steam in "steam boilers" and for heating "the liquid contents" of such vessels and of "coppers or pans." The fire-bars of the furnace consist of a series of horizontal bent pipes "extending in a "longitudinal direction up to the bridge" "and then in a zig-"zag direction across" its face. A pipe passes from the uppermost of the zig-zag pipes past the front of the furnace to the boiler and above its water level. Another bent tube is employed to carry water from the boiler to the hollow bars. It also passes outside the boiler and forms a bend into the ash-pit, and thence upwards in order to unite inside the furnace with the cross pipe which connects the different hollow bars. The bottom half of each of the hollow bars has adapted to it a V-shaped plate for shielding the bars from the cold air.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 5.—N° 622.

JACKSON, William, and WATKINS, Richard.—This invention relates to the arrangement and construction of direct-acting steam engines, either vertical, horizontal, or inclined. Instead of supporting and guiding the piston rod block or cross-head in the ordinary way, the piston of the air pump is made to perform that office, by rectilineally disposing the pump cylinder between the steam engine cylinder and the crank shaft, and mounting the piston of the pump upon the end of the main steam piston rod. The air pump piston is attached to a trunk, wherein the main connecting rod is fixed by a suitable joint to the end of the piston rod. A pair of direct-acting engines is shown and described. The cylinders are supported and fixed upon hollow side frames, which are bolted down to the foundation or sole plate; these hollow frames embrace the air pump cylinders and form the condensing chambers; the crank shaft is carried by three bearings attached to the sole plate. The excentrics, link, and reversing gear, are of the ordinary description. The feed and bilge pumps to each cylinder, are disposed at the end of the engines, and worked by a stud projecting from the side face of one of the forward excentrics, by means of a link connection; if preferred they may be worked from the end of the crank shaft, by a crank arm. The valve chests contain a slide valve for each

induction port, suitably attached to the valve rods, which are actuated in the usual way by excentrics; expansion valves are shown disposed at the back surface of the slide valves; they are regulated to the cut-off by means of a handle on the end of a rod screwed with right and left-handed threads, on which the valves are respectively mounted; they are actuated by a connecting rod jointed to a projecting stud which is fixed to the strap of the back excentric. The cylinders are circumvested with steam jackets.

[Printed, 10*d*. Drawing.]

A.D. 1863, March 6.—N° 634.

CUTHELL, Alexander.—This is an invention of self-acting dampers for steam engine furnaces. "An equilibrium valve is "placed in any convenient position between the boiler and "cylinder, the same being in connection with the steam pipe, "and capable of being adjusted to any required pressure by "means of springs or weights. A piston working in a cylinder "or some other analogous contrivance is employed, the valve "being placed so as effectually to close the communication "between the boiler and the last-mentioned cylinder and piston "until the pressure of the steam in the boiler is above that at "which the valve has been adjusted. The damper is connected "with the piston by means of suitable rods or gearing, such as "will be well understood by persons conversant with the con-"struction of steam machinery. Upon the pressure of the steam "in the boiler overcoming the resistance of the valve the latter is "actuated, and the steam being allowed to enter the before-"mentioned cylinder the piston consequently rises and the "damper is lowered by the upward motion of the piston. The "valve being upon the equilibrium principle is not effected by "the pressure of the steam in the contrary direction after passing "it, and the valve will consequently act freely under any varia-"tion of pressure in the boiler. The escape of steam from the "cylinder may be effected by the action of the valve in shutting "off the communication between the boiler and the cylinder, "by a small aperture at the bottom of the cylinder so con-"structed as to let off the steam gradually, and which aperture "may be kept constantly open."

[Printed, 8*d*. Drawing.]

A.D. 1863, March 6.—N° 635.

MAKINSON, Alexander Woodlands.—This invention relates to locomotive and stationary engines, and is supplementary to a previous invention by this inventor, as described in the Specification of the Letters Patent, bearing date 17th June 1862, No. 1789, which were then granted to him. The object sought by the previous invention, was to cause that end of the connecting rod of a steam engine which is coupled to the crank pin, to describe an ellipse round the driving axle, instead of a circle, which according to the said previous specification was effected by means of fixed elliptical guides, the crank pin having radial liberty to move to and from the centre by means of a slot in the crank arm. According to the present invention the elliptical circuit is communicated to the crank pin by lengthening the connecting rod, so that it extends beyond the driving wheel, where it is coupled to the free end of a lever arm, which is mounted on a fixed stud attached to the framing. As the free end of this lever arm in its revolution describes a circle, the diameter of which corresponds with the length of stroke of the piston, the crank pin which has radial liberty to slide in the slot describes an ellipse, and thus the object of the invention is effected in a more simple and efficient manner than it was previously by the use of the elliptical path or guide.

[Printed, 10*d*. Drawing.]

A.D. 1863, March 6.—N° 637.

GEDGE, William Edward.—(*A communication from Jules Mouvet.*)—(*Provisional protection only.*)—This invention relates to rotary engines producing it is stated direct rotary motion, by a new system of driving cylinder, which revolves within a cylindrical case, and which when applied to a locomotive, is to be keyed on to the driving axle, and in respect to stationary engines, it is to be disposed on the main shaft, whereon also there is to be a flywheel. The axis of the cylinder consists of a longitudinal tubular boss, which extends from end to end, and is bored to receive the shaft; diverging from the boss, are eight equidistant longitudinal plate arms, which are connected to the interior of and support the cylinder, the periphery of which is furnished longitudinally with eight semi-spherical grooved cavities, which extend the whole length and form respectively (octagonally circumposed) eight

projecting longitudinal ridges between. When the cylinder is mounted to revolve in its cylindrical case, the edge of each ridge comes in frictional contact with the inside of the case, and thereby forms each grooved cavity into a separate chamber for the reception of steam. The hollows formed in the casting under the ridges, are used as receptacles for a lubricant. The steam is admitted into the grooved cavities through suitable inlet passages formed in the case at right angles to the plane of the axis, and therefore it strikes obliquely into the cavities, directly against either one side or the other of the ridges, as they in succession come round, and so cause the cylinder to rotate in the direction according with that inlet passage which is uncovered; the exhaust passages are arranged to open at right angles with the inlet passages, which receive the exhaust steam, and the exhaust passages become the inlets when the direction of motion is reversed.

[Printed, 1*s*. Drawing.]

A.D. 1863, March 9.—N° 645.

WHITTLES, Henry.—(*Provisional protection only.*)—This invention relates to apparatus for collecting and returning the water of condensed steam into the boiler. The waste steam is conducted through one or more pipes and valves into a compound box or chamber, wherein is a float attached by a rod and chain to a balance wheel, which carries one or more pins or tumblers. The top of the box communicates by a pipe and valve with the steam space of the boiler; this valve is connected to a lever in contact with another lever, which is capable of being acted upon by the tumblers. The bottom of the box by means of a down pipe and valve communicates with the lower part of the boiler. As condensed water collects in the box, the float rises and causes the balance wheel to turn, when the valve which governs the steam communication is then opened by the action of the tumblers, whereby steam is admitted to the box, the pressure of which upon the surface of the water, forces the latter through the valve and down-pipe into the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1863, March 9.—N° 652.

INGLIS, William.—This invention relates to steam boilers and engines. As regards boilers the invention is more applicable

to those which are stationary. These boilers or generators consist of a numerous group of tubes, the ends of which are set into circular casings which form the ends of the generator, the whole by preference having a cylindrical form, the tubes, parallel with each other, being placed sufficiently far apart for the passage of the flaming gases and products of combustion through the interspaces. The apparatus is inclosed in a built furnace, inclining from a horizontal position, the furnace grate being under the highest end. This portion of the apparatus is completely filled with water, the working level being established in a cylindrical tube which is longitudinally superposed above the roof of the furnace, and by means of short vertical junction tubes, which are attached to the top side of the end casings, communicate therewith. The fire draught is carried off beneath the back end of the generator by means of a down flue. The heat of the furnace, impinging upon the tubes in their inclining position, keeps up an energetic circulation of the water. Suitable appliances and conveniences are arranged for access to the interior of the generator, and to the remote parts of the furnace, for the purpose of removing deposits. Several modifications of these steam generators are illustrated.

In respect to steam engines the invention is applicable to the gear for working steam admission valves, when (as in the "Corliss engine") they are closed by the action of weights or springs. According to one modification, india-rubber springs, or spiral steel springs, are substituted for the weight or the springs of flat steel previously employed, the object being to avoid noise and liability to breakage. Two modifications of adjustable releasing gear are also shown and described.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, March 9.—N° 653.

HUGON, Pierre.—This invention, which relates to machinery for obtaining and applying motive power, consists in causing the explosive force of inflammable gas mixed with a due proportion of atmospheric air, to act upon the surface of an intermediate column of water. When the explosion takes place, a vacuum is formed in a tube or chamber separated from the cylinder, causing indirectly by the displacement of the water the to-and-fro motion of a piston in the cylinder, and through it by means of a connecting rod, rotary motion of the crank shaft of an engine.

"The cylinder, in which the piston works, is separated from "the tubes wherein the explosion takes place; the power result- "ing from the dilitation of the gases is employed to expel a cer- "tain quantity of water from the explosion tube and to produce "a vacuum, the effect of which is added to that due to the con- "densation of steam arising from the combination of the hydro- "gen and oxygen and can be utilized in the cylinder."

"The several reservoirs of the engine are arranged in such "manner that the same water always circulates in the engine, "and that that which has been expelled from the tube fills the "cylinder on the side opposite to the chamber, which is at the "moment in connection with the vacuum produced. The cylin- "der being originally full of water it is the exhausting towards "the vacuum of the liquid contained in one of the chambers "which produces the movement of the piston; the water ex- "pelled from the tube which fills the opposite chamber, the "capacity of which increases gradually, acts in the same manner "at the following explosion. The result of this method of em- "ploying the power produced at the instant of the combination "of the gases is that the shock produced by the sudden and "instantaneous dilatation of the mixture is not transmitted im- "mediately to the motive parts; the power is applied to an "independent liquid, which is freely displaced by the pressure "exercised upon its surface. The contact of the gaseous residuum "with water, the temperature of which never exceeds 113° "Fahrenheit, allows the steam produced to be partly condensed "and to increase owing to expansion. The utilization of the "vacuum is rendered as perfect as possible by the presence of "water in all parts of the engine, for it is never filled except by "columns of liquid, the movement of which determines that of "the piston."

[Printed, 2*s.* 10*d.* Drawings.]

A.D. 1863, March 11.—N° 668.

BARCLAY, Andrew.—This invention relates to arranging and constructing self-propelling locomotive boring and winding engines. Several modifications of the parts are described; the first consists in attaching the parts of the engine to a rectangular framing, or by suitable means to the shell of the boiler, which is of the horizontal tubular class, whereon is fixed a pair of standards,

which carry the axis of a horizontal beam, actuated at one end by connection with the piston rods of two vertical cylinders, superposed upon the boiler. The opposite arm of the beam overhangs the end of the engine, and to it are attached the boring rods and tools. A horizontal cylinder, disposed on each side of the boiler operates a transverse crank shaft whereon there is a pinion which gears into a spur wheel on a shaft which carries the winding barrel, and rests between the standards, in bearings attached thereto; the pinion slides on a feather fixed lengthwise in the shaft, for the purpose, by means of a coupling and hand lever, of throwing it in and out of gear; the crank shaft also carries a pinion at each end, which when engaging with internal toothed wheels attached concentrically to the insides of the driving wheels, form an engine capable of locomotion and traction. The engine is guided from the rear by means of a hand wheel and horizontal shaft, which extends beneath the boiler, and operates by a worm at its extremity, upon a worm wheel fixed on the axle of the trailing wheels. The details may be variously arranged; the winding barrels may be disposed at either end of the engine, and the funnel be made a substitute for the standards, and carry the axis of the overhanging beam. The description of a modification consists of detailed arrangements of the parts in connection with a vertical boiler. When the boring tools are at work upon hard mineral, in order to prevent the vibration of concussion through the engine, india-rubber is interposed in the connecting link, between the boring bars and the beam.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, March 11.—N° 669.

BARCLAY, Andrew.—This invention relates to traction engines and apparatus for indicating steam pressure. The first part has reference and is supplementary to previous Letters Patent granted to this inventor, bearing date March 10th 1862, No. 646, and consists in so arranging the crank shafts of engines therein described, as to prevent the vibration of the driving wheels from effecting the beat of the valves. This is accomplished by means of a rigid connecting link through which the driving and crank shafts pass, which allows one end of the latter, upon which a pinion is keyed, to vibrate with the motions of its supporting spring simultaneously with the main axle of the driving wheels. The

other end of the crank shaft is supported in attachments to the main framing, which do not vibrate, whereby the throw of the valve is as regular in relation to the machine as it would be if both ends of the shaft were stationary. The invention further consists in connecting traction engines to their accompanying trucks or carriages by a T-shaped swivel coupling bar, arranged between the engine and carriages. The guiding of the engine and regulating its speed is effected by means of a duplex break action, so arranged that the motion of either or both the driving wheels, may be checked or caused to revolve at different speeds and so guide the machine. The axles of one or more of the accompanying trucks or carriages, are caused to swivel simultaneously in accordance with the altered direction of motion given to the engine. The driving wheels are arranged on hollow and solid axles working one within the other, or are mounted on axles contiguous to and parallel with each other. The pressure gauge consists of an elastic or flexible steam-tight diaphragm interposed between water and steam in an air-tight glass tube; the water is raised by the steam pressure, and reacted upon by the compression of the air contained above the water in the closed top of the tube; the height of the water exhibits the pressure.

[Printed, 10*d*. Drawings.]

A.D. 1863, March 13.—N° 685.

STÜBBE, William Hermann.—(*Provisional protection only.*) —This invention relating to governors for marine and other engines "consists in a peculiar construction of hanging shaft " carrying the governor balls and driven from above, and also in " fitting such hanging governor in gimbals or an universal joint, " so that it may always hang vertical notwithstanding the motion " of the ship or vessel, the gearing that rotates said governor " always remaining properly in contact, and hence the governor " is rendered as efficient in regulating the speed of a marine " engine as of a stationary engine." The parts consist of a ring or gimbal, set so as to swing on the end of a shaft on one side, and a stud on the other side, both of which are mounted in a suitable frame; another shaft passes in a diametral direction across the gimbal ring, with a swinging yoke attached; the governor spindle is suspended from the centre, in relation to which the spindle is rotated by bevel wheels. The arms to which

the governor balls are suspended, are attached to the upper part of the spindle, which is hollow and contains an internal rod which when raised by the action of the balls, connecting links, and sliding sleeve, operates a rod in connection with the throttle or expansion valve. Instead of two, four governor balls acting at right angles relatively are preferred, and a weight ball is attached to the lower end of the spindle to steady the apparatus.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 14.—N° 691.

WEST, William.—This is an invention relating to valves applicable to air pumps, and for foot valves in steam engines; also to feed and hydraulic pumps.

Centrally upon the pump bucket is fixed a raised inverted chamber, which is open at the under side. This chamber in form resembles the base of a cone, around which externally is recessed a spiral flute or semicircular groove. The bottom of the groove, which forms the valve seating and coils spirally several times round the chamber, is perforated at intervals more or less, so as to form a series of communications through the sides of the chamber, for the passage of air or water from beneath to above the bucket, and disposed spirally round the chamber, fitting to the curve of the groove, is laid therein so as to cover the series of holes, a round band or cord of india-rubber or other elastic material, which is secured at the upper and lower ends of the groove, and constitutes the valve. When the return action is on the pump, the elastic band yields and permits the passage of the fluid, but is pressed into the groove during the draught action; the holes are then closed by the pressure of the band, so as effectually to prevent the reflux of the fluid.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 16.—N° 702.

HOYOS, Felix.—This invention relates to a mode of supporting combustion in stoves, furnaces, and fire-grates; it is adaptable to heating boilers, cooking, and similar and other purposes, including steam boilers of locomotive, stationary, and other engines. The bottom and front of the ash-pit, or the under part of a fire-grate is closed; the air draught is introduced in various ways above the fuel and takes a downward course, passing through the bed of fire

to beneath the grate bars, and then up through a central tube into the boiler or other flues, or to the chimney. When fresh fuel is added to an incandescent fire, all the fuliginous and gaseous products are drawn downwards, and whilst passing through the burning fuel, are entirely consumed. Various devices are necessarily required to adapt the principle of the invention to its numerous uses and applications; several are described and illustrated, in some of which steam is introduced above the fire to assist combustion.

[Printed, 8*d*. Drawings.]

A.D. 1863, March 19.—N° 736.

WILDE, Henry.—This invention relates to the so constructing steam boilers, that (it is stated) the peculiar kind of corrosion known as furrowing, which occurs or forms contiguous to the rivets, and near the edges of the angle iron, and also in other parts where one piece of iron in a state of vibration and tension is in contact with another part, is greatly diminished or prevented. It consists in interposing between the transverse and longitudinal lap joints of the plates, and between the plates and the angle iron and parts, a thin fillet or band of sheet copper, which is perforated to correspond with the rivet holes, whereby the plates and parts are secured together, the copper fillets being fixed between. These fillets extend somewhat beyond the edges of the plates inside the boiler, so as to cover those parts where the furrows usually form. Instead of using copper fillets between the joints, the plates may by any of the well known methods, be coated by deposits of that metal or its alloys.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 20.—N° 744.

BARCLAY, Andrew, and MORTON, Alexander.—(*Provisional protection only.*)—This invention relates to "apparatus for "injecting and ejecting fluids," and consists according to one arrangement "in the placing of two flat or curved discs parallel, "or nearly so, and near to each other, but with a small space "between. One of these discs with a pipe or pipes attached "communicates with the actuating fluid by an orifice through "the centre of the disc, whilst the other disc with its pipe or "pipes attached communicates with the water or other fluid to be "actuated upon by an orifice at some distance from its centre;

"this orifice may be either a ring of holes, slits, or openings of "any similar kind. When steam or other actuating fluid is "admitted through the orifice in the centre of the former said "disc, it impinges against the solid centre of the latter disc, and "radiates in a thin sheet between the two towards their circum-"ference; this motion causes the fluid now acted upon to be "drawn or forced through the ring of holes, slits, or other open-"ings, and carried along with the actuating fluid for the purpose "of being injected or ejected. When arranged for the purpose of "feeding water into steam boilers the discs may be surrounded "by a suitable casing, so as to collect and concentrate the water "previous to its entering the boiler, or the apparatus may be set "into the boiler itself, and the disc wholly surrounded by the "water contained therein; in this case no casing may be required "to collect the entering water, but merely the pipes and cocks "communicating with the apparatus. An overflow pipe may "be conveniently arranged and connected with one of the discs "by forming a communication between the discs at some distance "from their centres by means of holes, slits, or other openings."

[Printed, 4d. No Drawings.]

A.D. 1863, March 21.—N° 756.

BIDDELL, George Arthur.—This invention, relating to traction engines for use on common roads, consists of the application to such engines of a friction clutch or clutches in combination with suitable driving and disengaging gear. The piston rod, through the connecting rod, gives motion to the crank shaft, whereon is fixed the fly-wheel and also, by preference, the friction clutch, whereof the sliding half is always turning with the shaft by means of a fixed feather, whilst the other half, which carries a tooth wheel, is confined between collars fixed upon the shaft, and only turns with it when the two halves of the clutch are pressed or clasped together. The toothed wheel gears into another wheel upon a second shaft, whereon are two toothed pinions which have longitudinal liberty to slide, but are compelled to turn with the shaft by fixed keys or feathers; these pinions are coupled together and moved simultaneously by a double crank, connecting rods and forked levers, or their equivalents, in such manner respectively, that when one goes out of gear the other slides in; the sliding movement of the pinions is effected by interposed mechanism

and cranks on a separate shaft, whereon also there is a lever handle for turning in either direction. One pinion engages with the internal gearing of a spur wheel, and the other with a spur wheel of lesser diameter externally geared; these spur wheels are fixed on another shaft which carries at each end a sliding pinion, which gear respectively into the annular gearing attached to the driving or main road wheels. Engines arranged in this manner, do not require the ordinary reversing gear, and may be fitted with one cylinder, "thus giving greater simplicity and economy, as "also less wear and tear."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1863, March 23.—N° 763.

ROTHWELL, John William Hughes, and ROTHWELL, Edmund James.—(*Provisional protection only.*)—This invention, for heating the feed water of steam boilers, consists in placing in the boiler flue, contiguous to the furnace bridge, a circuitous coil of pipe, through which the feed water is mechanically forced. The communicating pipes from the pump to the coil, and thence to the point of junction with the boiler, may either be carried through the ash-pit, or disposed in the flues beyond. If desirable the feed may at once be taken into the boiler, close to the bridge direct from the end of the coil.

[Printed, 4*d.* No Drawings.]

A.D. 1863, March 26.—N° 796.

JOHNSON, John Henry.—(*A communication from Louis Hébert.*)—(*Provisional protection only.*)—The object to be obtained by this invention, is a better and more perfect combustion of small and inferior coal, in steam boiler and other furnaces or fire-places.

The "hydrofère" or apparatus employed, consists of a tubular case, fitted transversely inside the door of a closed ash-pit; the outer end of this tube is open to the atmosphere, and the inner end is closed, but a line or series of holes, opening incliningly upwards, is made along that portion which is disposed inside the ash-pit. A small steam pipe, perforated to correspond with the holes in the tubular case, is concentrically placed therein. When steam is turned on, it escapes in jets through the perforations in the small pipe, and straight through the holes in the tubular case,

directed against the underside and between the furnace bars, mixed with the atmospheric air which is induced or drawn in to the open end of the tubular casing, by the tendency to create a vacuum, caused by the velocity with which the jets of steam pass from the inner steam pipe through the interspace between the pipe and casing, and out through the holes in the latter into the open space of the ash-pit. The invention, modified, is applicable to heating and welding furnaces, and also to puddling furnaces, wherein, by reason of the impulsive force of the steam jets, the stream of flame is considerably augmented.

" In locomotive boiler furnaces the tube of the injector may be " placed horizontally outside the ash-pit, whilst in marine boiler " furnaces it may assume a vertical position; but in both cases " the end or ends of the tube or tubes is or are provided with a " bend to direct the jets upwards against the grate."

"The injecting apparatus . . . . . is applicable to the " furnaces of brick, pottery, and other kilns, and to every descrip- " tion of furnace where grate bars or equivalent means are em- " ployed for supporting fuel."

[Printed, 4*d*. No Drawings.]

A.D. 1863, March 30.—N° 816.

MUSGRAVE, Joseph.—This invention relates to the construction and arrangement of the flues of steam boilers, and has the advantage of equalizing the expansion due (more particularly when steam is raised rapidly) to the heating of the upper part of the fire-flues, and the upper part of the shell, before the lower parts of the boiler. Two examples of horizontal cylindrical boilers are shown, one containing a single, and the other two cylindrical flues; both boilers are set in brick-work and rest on two longitudinal ridges which form three external flues, one along the centre underneath each boiler, and one on each side, which are covered in by the gathering in of the brick-work. The cylindrical flues are centrally divided by a transverse partition, before and behind which there is a vertical downward passage leading from the internal flues through the water space and shell of the boiler to the central flue beneath. The furnaces are arranged in the ordinary way at the front end of the cylindrical flues. The flaming gases and products of combustion after passing the bridge into the body of the flue, course downwards through the vertical

passage in front of the partition, into the lower flue (which is also transversely divided) and return therein towards the front of the boiler where it communicates with the side flues, each of which receives a portion of the hot draught, which courses through them to the back of the boiler where the side-flues communicate with the after ends of the internal flues which the draught enters and traverses, passing down the vertical passage at the back of the central partition into the back part of the lower flue and thence to the chimney.

[Printed, 10*d*. Drawings.]

A.D. 1863, March 31.—N° 825. (* *)

SMETHURST, John.—"Improvements in steam engines and "boilers," partly "applicable to heating purposes." The drawings show "a compound boiler" constructed with an inner and an outer shell, and having distinct horizontal furnace flues. In the Provisional Specification an inner shell is proposed to be connected with "a vertical boiler" having "a vertical flue and "furnace." "Behind the bridges" the flues are united "so as "to form a combustion chamber, between which and the back "of the boiler a series" of flue tubes can be placed. "The "heated gases would then pass to the front end of the boilers" through tubes "in the lower part of the external shell," in order to afterwards flow through tubes "underneath the boiler, or "along the sides, or through other internal flues," and thence to the chimney. The steam from the inner shell, at a higher pressure than that in the outer shell, supplies a high-pressure engine, whence it is fed into the outer shell for supplying another cylinder. The exhaust steam can then be conveyed through pipes for heating buildings. A compound boiler is also to be applied to locomotives. The outer shell and fire-box are of the usual shape, and the tubes are either enclosed in an ordinary inner shell, or the outer shell may also be fitted with similar tubes for conveying back the gases. Each shell has a distinct set of the usual fittings. Two of the four cylinders to be employed are supplied with high pressure steam from the inner shell, and the exhaust steam is to be discharged into the outer shell to be employed in another pair of cylinders. The exhaust steam from these can be used for heating the carriages. It is passed through "pipes placed on the tops of the carriages," communicating by

vertical pipes with foot-warmers, leading to a main pipe for collecting the condensed water, from which it is pumped into the engine tank. Fire-bricks or tubes are placed "in the interior of "the fire-box." In "a boiler with a vertical flue and furnace" the upper part of the flue is wider, and the intermediate space is open to the water in the boiler, "by which means the heated "gases will enter the water," a blowing apparatus being employed for forcing "them in."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1863, April 1.—Nº 842.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Edward Dickerson.*)—This invention relating to steam boilers, "consists in combining tubes, through which the water passes, "and which are in the furnace, with tubes through which the "products of combustion pass, and which are surrounded with "steam or with steam and water, so that after the heat of com-"bustion has partly spent itself in evaporating the water which "passes through the water tubes it will superheat or dry the "saturated steam which is evolved from the water tubes, thereby "commanding the highest evaporating power in the smallest com-"pass, and with the greatest facilities for cleaning and repair."

The boiler described and illustrated is rectangular at the base; the furnace, which reaches to a considerable height, is surrounded by water space, and is divided by a vertical water-space partition, so as to form separate chambers for two ranges of furnace bars. The top of the plates which form the water-space partition, are united respectively to tube plates which cover the two sections of the furnace, and are united to the top edges of the plates which form the sides respectively, and the back and front of each furnace section. These tube plates incline nearly to a horizontal position from back to front, and each is perforated for the reception of an upper curved group of fire-tubes, and a lower group of curved water tubes. The lower ends of the upper group of tubes, are set down vertically into and occupy the back half of each tube plate, curving, as they rise through the upper water and steam space, towards the front, where they open horizontally to the chimney flue through the upper front plate, which is perforated to receive them. The upper ends of the lower groups are set up into and occupy respectively the front half of each tube plate.

These tubes descend vertically into the furnaces, and curving backwards, are set into the furnace back plates, and so form a communication between the water above the tube plates, and the water space respectively at the back of each section. The flaming gases and products of combustion pass transversely through the interspaces between the tubes of the lower group, and entering the tubes of the upper group, pass upwards therein through the water and steam spaces, where, as they course on to the front of the boiler, they serve to dry or superheat the steam.

Modifications wherein straight tubes are employed are shown and illustrated.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 2.—N° 850.

PÔTEL, JEROME JEAN.—The object of this invention, which relates to furnaces and fire-places, is the consumption or prevention of smoke. This is effected by the particular arrangement of a series of draught passages, which are the only outlets for the heated products of combustion. These passages lead out of the furnace through the side and back walls on a level with the fire-bed, incline upwards at an angle of about 45° and open into the flues. A portion of the air necessary to support combustion in the furnace is admitted between the fire-bars, a portion is admitted into the furnace, so as to pass over the bed of the burning fuel, and another portion is admitted to mingle with the heated gases in the flues.

Modifications of the invention, as applied to different kinds of furnaces and fire-places, are illustrated and described, comprising steam boilers with external and internal furnaces, and domestic stoves for cooking and heating apartments.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 4.—N° 858.

SILVESTER, JOHN.—(*Provisional protection only.*)—This invention, relating to pressure gauges, consists in shielding from injury, by means of a perforated metal guard, the glass plate which usually covers the dials of pressure gauges. This guard together with the bezel or rim in which the glass plate is circumvested, are made in one piece, either by casting or stamping, or if

made separately they can be united by soldering or otherwise, or the guard may be made to fit accurately into the rim; in the latter case, the guard is held in its place by two pins or screws, fixed respectively in the opposite sides of the rim, and the guard is notched to correspond, so that when pushed up to its place and partially turned, the plain part of the periphery of the guard is brought behind the screw or pin, whereby the guard is securely held to the face of the dial, the glass plate being interposed between them. The readings on the dial can be seen through the perforations of the metal shield.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 4.—N° 862.

NEWTON, Alfred Vincent.—(*A communication from Philip Justice.*)—(*Provisional protection only.*)—This invention relates to an "improved construction of pressure gauge" applicable mainly to steam or water under high pressure. A metal disc or plate is provided with a mercury chamber recessed underneath; a central opening is made through the disc for the upward and downward movement of the mercury. A cylinder of india-rubber, is fitted into the recess, forming a bearing for a glass tube, which is enclosed in a tubular case; the position of the mercury in the glass tube is seen through a slot in the case, and the pressure indicated upon a graduated scale. A metal cap screwed to the metal case secures the glass tube. The mercury is inserted through a lateral hole in the disc, which, when the chamber is filled, is closed by a screw. A cylindrical cup is clamped to the underside of the disc, with a diaphragm of india-rubber interposed between them. The bottom of a plunger, larger in area at the top than at the bottom, and loosely contained in the cup, rests upon another diaphragm interposed between the bottom of the cup and a coupling, whereby steam or water is admitted to act on the plunger, the downward movement of which is limited by a shoulder in the cup. When the pressure is brought to bear upon the plunger, the mercury is forced out of the chamber up the glass tube, and there indicates by its height upon the scale the amount of pressure applied. By these gauges short columns of mercury for the measurement of high pressure may be employed without any other opposing medium.

[*Printed*, 4*d*. No Drawings.]

A.D. 1863, April 7.—N° 872.

SWINBURNE, John, and STANLEY, John.—This invention relates to steam engines and generators, and consists (1.) of apparatus for actuating the slide valves of steam engines, thereby giving to such valves differential movement and power to reverse. An annular shaft or tube is fitted loose upon the engine crank shaft, with liberty partially to rotate; two fixed studs or trunnions project from this tube at opposite sides, on which (embracing the tube) is mounted a gimbal ring, which (in relation to the line of the shaft) is capable of being set and held at an oblique angle therewith by a connecting link. The wabbling motion of the gimbal when so set, is availed of for giving motion to the slide valve, through the medium of a bell crank and connecting rod. When the gimbal is set at right angles, the valve is at rest; and when set at an oblique angle, one way or the other, it determines the direction of motion; the amount of obliquity regulates the length of traverse of the valve, and the limited rotative action, the amount of lead. 2. Another mode is described for actuating the valve rod and slide valve, by means of a single excentric and an ordinary clip and rod, so operated by wedges, as to increase or diminish the throw of the excentric, and consequently the amount of lead. 3. Relates to a mode of increasing the sensitive action of ordinary ball governors, which are actuated through the links from the sleeve, and not as usual by the arms, which are attached to a loose boss, between collars at the upper part of the governor spindle. 4. Relates to the construction of upright cylindrical boilers, in which the water space is extended under the ash-pit, and circumvested by a flue, which extends around and underneath. A series of horizontal tubes connect the flue space to the fire space. The hot draught has a downward course, passing under the bottom of the boiler before entering the chimney flue. A modification is shown and described.

[Printed, 1*s*. Drawings.]

A.D. 1863, April 7.—N° 880.

HOWARD, James, BOUSFIELD, Edward Tenney, and PINNEY, John.—This invention, relating to steam engines in combination with apparatus used in the tilling of land, consists,

1, in the novel arrangement of a steam engine for setting in operation, by means of traction ropes, ploughs or other implements. The engine frame is borne by a pair of carrying wheels, which are fitted with internal toothed rings; when locomotion is required, these wheels are driven by gearing, brought into activity, in connection with the crank shaft and bevel gearing, by friction discs or clutches. The barrels for carrying the traction ropes are mounted on the engine frame beneath the crank shaft, and are driven by gearing direct therefrom; the crank shaft is longitudinally disposed and runs through a divided or horse-shoe formed boiler. By means of eccentrics on the axis, the barrels can be lowered and the shaft thrown out of gear. The two limbs or sides of the boiler are alike; each part may contain a cylindrical or rectangular fire-box surrounded by water space; rows of tapering water tubes, inclining from the sides of each fire-box, near to the fire-bars, communicate through the top with the water space above. The arched top of the boiler constitues the steam space, which is covered by a casing, forming an arched chamber or superheater, whereinto, through short lateral flue tubes, the flaming products of combustion pass from the top of each furnace respectively to the chimney. The cylinders are vertically disposed between the supporting limbs of the boiler, the pistons and connecting rods working upwards direct upon the crank shaft. The steering wheel is operated by a pinion which gears into a toothed sector, so coupled with the intermediate sliding shaft as to be able to throw either one or other of the carrying wheels out of gear, whereby the engine can be made to turn in double the space of its own breadth. When the engine is drawn by a horse, the steering gear is dispensed with. Instead of two barrels for carrying the rope, a hollow drum is used, whereon, mounted upon frames bolted to the interior, is a barrel, upon which that portion of the rope intended for use is wound and guided thereon by sheaves; the barrel is rotated by a worm and worm wheel when not interlocked therewith. One end of the rope is fixed to the periphery of the drum, and a portion wound thereon equal to the length of traverse of the tilling implement, another portion is passed round the field, and the remainder is wound upon the barrel, passing thereto through a suitable opening in the surface of the drum; slack is taken in upon the barrel by the attendant who, by reversing motion, can regulate the length of rope required. The ploughs or tilling implements are mounted in sets upon the

extremities of a rocking frame, and are brought alternately into use, one set operating during the outward course or "bout," and the other set during the return. When a course is ended, the set of ploughs or implements last in operation, are, by suitable means attached to the rocking frame, under the control of the attendant, raised out of the ground, whilst the set at the opposite end of the frame, by the same action, is lowered and brought into position to operate during the return course. The invention includes the adaptation of the light or fly-rope system, whereby a proper speed is imparted to the implements.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1863, April 8.—N° 882.

HILL, George, and HILL, William Ridings.—(*Provisional protection only.*)—" This invention consists in forming in the " internal flues of steam boilers one or more water-tight compart- " ments which act as stays, and also provide additional heating " surface. For a boiler with a single internal flue we cause the " flame and heated gases after they have passed the bridge to pass " through an opening to the bottom and return to the front end " of the boiler, and then pass along the sides to passages or " openings leading to a chamber in the flue bounded by two " water-tight compartments, from which chamber the flame and " gases pass to the bottom, and then along the sides into the " back part of the flue from whence they return at one side of a " midfeather to the other side and proceed onward to the chim- " ney. Or instead of passing the flame and heated gases after " they have passed the bridge through a passage leading to the " bottom and then along the sides they may pass along the sides " and return along the bottom. For a boiler having two or more " internal flues we use similar water-tight compartments, and " pass the flame and heated gases through flues at the sides and " bottom to the chimney."

[Printed, 4*d.* No Drawings.]

A.D. 1863, April 9.—N° 896.

SPENCER, George.—This invention relates to apparatus for preventing incrustation in steam boilers, which consists of a closed vessel containing a series of concave or dished surfaces,

placed respectively, a suitable distance apart, one above another, so as to form a vertical range of horizontal dished shelves; each division or dish is perforated with holes round its margin, a short distance from its edge, which is turned up all round. The feed water is caused to flow from the supply into the top dish, and thence when the dish is full, through the perforations round its edge into the second dish, thence in the same manner to the the third, and so on to the bottom dish, whence it is discharged into the boiler. Steam is admitted within the chamber, whereby the water contained is heated to a boiling temperature, in which state it deposits within the dishes all calcareous and other matter held in solution. Instead of employing the dished shelves of a uniform size, they may be made to vary in area, the top one being the smallest, and each one in succession increasing in size to the lowest, so that in descending from the top dish, the feed water shall overflow from dish to dish in its progress to the bottom. The inside of the vessel and of the dishes, as also the internal surfaces and parts of the boiler are coated with a suitable covering, such as "Green's oxide paint" in order to prevent the adhesion of deposited matter.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 9.—N° 903.

LOW, George.—This invention relates to machinery for boring rocks and hard substances, combined with a steam or other motive-power engine, the conjoint action of which (it is stated) greatly expedites the driving of adits and working of quarries.

"The machinery, which admits of various modifications, may "be described as consisting of a frame in which is mounted one "or a series of cylinders fitted each with a piston attached to a "hollow rod which carries at one end a hollow boring tool. The "frame will run on wheels for driving horizontal adits or railway "tunnels, and against the face of quarries, or it may be arranged "to hang from a chain when driving or sinking perpendicular "or inclined shafts."

"Another form of frame (being a portable one) consists of a "pillar or column which can be adjusted betwixt the top and "bottom of the adit in any position by the attendant."

"In one arrangement the working cylinders are set on guide "frames along which they slide by a self-acting worm and screw

"motion according to the progress of the boring tool. Each of "the cylinder frames is so arranged as to admit of being easily "moved by the attendant either perpendicularly or sideways, and "also at any angle in either direction for the purpose of bringing "each of the tools into a position suitable for the nature of the "rock strata to be bored. The pistons are worked either by "steam conveyed by pipes covered with felt, or with compressed "air, or by any other motive gases."

The boring tool has three motions communicated to it; 1st, the horizontal boring motion given by the forward stroke of the piston; 2nd, a rotary motion on its axis, caused by the slow rotation of a worm wheel: and 3rd, a slow advancing or progressive motion, caused by the rotation of a screw in a stationary threaded socket or nut. The pulverized stone and debris is washed out of the hole by water, introduced through the hollow piston rod and boring tool.

[Printed, 2s. 6d. Drawings.]

A.D. 1863, April 10.—N° 907.

BALDWIN, Thomas.—This invention relates to apparatus for superheating steam, which consists of a furnace and separate flue wherein is encased a group of tubes, which may be disposed in either a vertical, horizontal, or oblique position; the steam from the boiler on its passage to the engine, is made to pass through these tubes, and the heated gases and products of combustion are directed between them; diffusing plates of metal or fire-clay, may be used to distribute the hot draught equably amongst the tubes, after which they are either allowed to pass to the chimney, or if thought desirable are conducted into the boiler flue, for which purpose suitable dampers are disposed in the flues to regulate and constrain their direction. Tubes are also used centrally disposed within larger tubes, whereby an annular channel is formed between for the interflow of steam, in which case the hot draughts are directed through the small inner tubes, and between in the intervening spaces exterior to the larger ones. In all cases where convenient, the steam current flows in a direction contrary to the course of the hot draughts. The heating furnace should be contiguous to the boiler; it is shown disposed in the brickwork between two boilers of the horizontal class.

[Printed, 8d. Drawing.]

A.D. 1863, April 11.—N° 916. (* *)

LOCKWOOD, John.—The bridge of a steam boiler or other furnace is "formed hollow with a grating towards the fire-bed "and open to the ashes-pit." Behind this grating is a swing "door," "capable of being" either opened or closed "against "the openings of the grating," in order to regulate the admission of atmospheric air.

[Printed, 8*d*. Drawing.]

A.D. 1863, April 13.—N° 924.

RAMSBOTTOM, John.—This invention relates (1st) to steam hammers, and (2ndly) to a combination of machinery for rolling and shaping metals.

The steam hammers are designed with two or more hammer blocks, which act convergently from opposite directions upon the ingot of steel or metal under the hammering process, in such manner that their acting force may be received simultaneously upon the interposed metal, and thus become, relatively to each other, a counteracting resistance; no anvil being required. The hammer blocks, rectineally opposed to each other, are mounted on rollers or wheels which run to and fro on rails bolted to the foundation, beneath a central break or opening in which, is placed the steam cylinder. The piston rod carries a crosshead which works works upwards in vertical guides, and actuates two pairs of diagonally disposed levers, respectively employed at opposite angles for connecting the crosshead to the hammer blocks. The steam is admitted by means of a cylindrical slide valve, which by the aid of a lever obtains motion from the piston rod. The ingot of steel or metallic article is supported on an appropriate carriage or frame, to which the necessary movements can be imparted for presenting all parts of the ingot to the blows of the hammers. For actuating heavy hammers, two steam cylinders are employed. Several modifications of this part of the invention are illustrated and described.

The rolling and shaping apparatus consists of rollers furnished with removable segmental surfaces. These surfaces are grooved or shaped to act in corresponding pairs, one being fixed on each roller, so that when by means of reversing gear the rough ingot

is passed and repassed between the surfaces, it is squeezed and swaged or moulded, and by degrees is brought to assume the required form.

[Printed, 3s. 6d. Drawings.]

A.D. 1863, April 14.—N° 942.

SMITH, John.—This invention, which relates to furnaces and steam boilers, consists with regard to furnaces,—

1st. Of apparatus for moving every alternate fire-bar, in order to prevent the formation of or to break up clinkers adhering to and between the bars, or upon the furnace grate surface. This is effected by suitable contrivances operated by hand or power, and acting under the ends of the movable bars, so as to cause them to rise above the level of the intermediate bars, which are fixed.

2nd. This part of the invention is applicable to locomotive and such like boilers. In consists in constructing within the furnace, immediately over the fire, below the lowest range of fire tubes, a horizontal hollow partition or water space, communicating with the body of water in the boiler. This partition extends from side to side of the furnace, but leaves a narrow draught way at back and front for the passage of the burning products of combustion from the grate chamber to the upper chamber, and flue tubes or flues. Vertical fire draught passages are also formed through the partition, which is also furnished with water tubes, projecting from the surface, for the purpose of obtaining increased heating area.

3rd. Relates to a fusible plug which consists of two parts. The central part contains the plug of fusible metal, and is threaded externally to screw into the other part, which is fixed in the crown of the boiler furnace. Some of these plugs are capable of being fixed from the inside of the furnace without the necessity for entering the boiler.

4th. Relates to the manner of fixing the fusible portions of the plug into the part or ring which holds it. This is effected by tapping the inside of the ring with a screw thread, corresponding with the screw thread cut upon the surface of the metal piece which contains the fusible metal, so that the one part is screwed into the other, and can at any time be removed without interfering with the part which is fixed in the crown of the furnace. Other plans are resorted to.

[Printed, 10d. Drawing.]

A.D. 1863, April 15.—N° 944.

COLQUHOUN, Ewing Pye, and FERRIS, John Pardoe.—(*Provisional protection only.*)—This invention relates to fire-bars for the furnaces of steam boilers and fire-grates, which unlike other movable fire-bars, are supported near their midlength on two bearing bars, which partially revolve on their axes. "The "fire-bars on their upper surface are considerably curved to give "strength at the point mostly required on the under side; there "is cast on the bars a pin or tongue fitting into holes formed "on the bearing bars, which serve to keep the fire-bars in posi-"tion, and form the draught or air spaces. One half the required "number of fire-bars necessary to form one tier or range in a "furnace are carried by one bearing bar, and the remaining half "by the other placed in juxtaposition. The fire-bars are so "packed in the bearing bars that a space sufficient for a fire-bar "is left between each, so that when the two bearing bars with "their allotted number of fire-bars are arranged in their proper "position the fire-bars carried by each bearing bar dovetail into "each other and form the furnace, with the necessary width of "air spaces between each fire-bar; cast on the side of each bear-"ing bar are teeth, so that when one bearing bar supporting "one-half of one range of bars is moved the bearing bar in juxta-"position and supporting the other half of the same range of "bars moves in an opposite direction, causing an extensive "lift or upward motion to be given to all the fire-bars, but while "the ends of one-half the number of the bars are being raised "the ends of the other half are descending by the side of the "uplifted section. Two or more ranges of these fire-bars are "easily made moveable and by one lever only, by the front "bearing bars of each and every range of fire-bars being con-"nected by a rigid rod; the action then given to the bars in one "range is imparted to the bars in the other ranges. The bars "can either be moved by a hand lever, giving an intermittent "motion or by being connected with an engine, and giving a "continuous motion."

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 16.—N° 957.

TERRETT, Charles.—This invention relates to the composition of a mucilaginous paste, which is used in steam boilers to prevent incrustation. It consists of a compound of terra

japonica, or mamosa japonica, myrabolams, devi-devi, and cutch, in variable proportions. The substances are mixed and boiled together in water until evaporation has reduced the residue to a thick paste, having been strained during the process while sufficiently fluid. When the feed water is only moderately hard, equal parts by weight of the four substances are found to make a suitable composition with which to supply a boiler, at the rate of ½ a lb. for each nominal horse power; this quantity it is stated, will prevent incrustation for a month, although more, according to circumstances and the condition of the feed water, may be required. For marine boilers it has been found desirable to increase the quantity of cutch to 82 lbs., mixed with 10 lbs. of each of the other ingredients.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 17.—N° 966.

GOUCHER, John.—This invention relates to the construction of steam boilers, and to regulating the admission of air to the furnace. In shape these boilers taper in the direction of their length from the front end, and may be made either with or without a fire box. They are formed by two truncated conical tubes closed at the ends; one, the flue section, being disposed eccentrically within the other, which constitutes the outer shell, the interspace between serving for the water, which covers the inner section and leaves steam space above. In some cases a longitudinal superheating pipe is fixed in the flue section depending from the upper part, whereto it is united by means of flanged upturned bends. This pipe is put into communication with the upper part of the steam space at one end, and with the pipe which supplies the engine cylinder at the other, the steam being superheated whilst passing through. A cistern, wherein the feed water is heated, surrounds the base of the chimney funnel, and a coil of pipe disposed within the cistern round the chimney, conveys the exhaust steam first through the coil to heat the water, and thence to form a blast up the chimney. In some boilers, instead of the superheating tube, a longitudinal tube with lateral branches in communication with the side water spaces is disposed in the conical flue tube.

For regulating, in relation to the degree of steam pressure, the admission of air to the furnaces of steam boilers, the steam at the boiler pressure is caused to press upon a spring or a counter-

balanced piston, which by means of suitable connections actuates two dampers fitted respectively to the furnace door and to the ash-pit, and so operates them, that when the steam pressure is excessive, the damper at the door is opened, and the ash-pit damper is closed, and vice versa when the steam is below the working pressure.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, April 20.—N° 979.

RANDOLPH, CHARLES, and ELDER, JOHN.—(*Provisional protection only.*)—This invention relates to multitubular surface condensers, as regards the mode employed for fixing the tubes in the tube plates, into which short tubes or ferrules are fixed "so "as to project a little on the outer side, and the condenser tubes "are passed through these fixed tubes, being made of such a "length as to project a little beyond their outer ends. There is "is then passed over the end of each condenser tube and fixed "tube a short tube of an elastic material, such as vulcanised "rubber, which grasps both and makes a water-tight joint with-"out hindering the slight movements caused by the expansion "and contraction of the metal." According to a modification, instead of using the short tubes or ferrules, projecting rims are formed on the plates themselves.

[Printed, 4*d.* No Drawings.]

A.D. 1863, April 20.—N° 981.

BLANC, CLAUDE. — This invention relates to apparatus for combining air with steam, and using their united elastic force as a motive power. The objects to be obtained are, 1, increase of power; 2, loss of power prevented by restoring the steam (which would otherwise be allowed to escape) to the generator, and which consequently renders the use of feed pumps unnecessary; 3, economy of fuel; and 4, preventing the incrustation of calcareous and sedimentary deposits in the boiler. The exhaust steam from the engine is received into a chamber enclosed in a case or jacket; by means of a double acting air pump, the atmosphere is forced into the chamber, there to commingle with the exhaust steam. The combined fluids are drawn through a pipe attached to the lower part of the vessel by means of a pump, which afterwards forces them on through service pipes into the boiler or generator, the steam being in a partially condensed state; the service pipes

are provided with stop valves to prevent any reflux of water from the boiler. The air is admitted, through a perforated distributing plate, into the upper part or neck of the chamber in regulated quantities, by means of a cock containing a compound plug and a pipe in connection with the pump. The working speed of the pumps will be regulated to suit the speed of the piston of the engine to which the apparatus is applied.

[Printed, 8*d*. Drawing.]

A.D. 1863, April 21.—N° 990.

RUNKEL, MARK.—(*A communication from Henry Behrens.*)—This invention relates to centrifugal ball governors for marine steam engines, the action of which is not impeded or deranged by the rolling and pitching of the vessel. It consists in mounting the governor (after the manner of mounting ships' compasses) on framing, so suspended and connected thereto by gimbal joints that the perpendicularity of the central spindle is always maintained. The governor balls are attached to arms suspended in the usual way, and united by means of connecting links to a sliding sleeve on a hollow spindle, wherein is a rod which is operated by the sleeve, as the plane of the revolution of the balls alters. The spindle is suspended in a frame, which has two projecting arms resting on fixed pivots inserted on each side the centre of an outer frame. The governor is actuated by bevel wheels in connection with a driving shaft, which is arranged in position in relation to the centre of suspension. The rising or falling of the rod within the governor spindle is disposed in such relation to the gimbal, that when the balls assume their mesne position, corresponding with the normal speed of the engine, the top of the rod coincides with the common centre, so that the motions of the vessel, and consequent motions of the governor frames, do not influence the action of the governor, or in any way effect the throttle valve.

[Printed, 1*s*. Drawing.]

A.D. 1863, April 22.—N° 998.

BRYANT, FREDERICK EDWARD. — (*A communication from Hans Ambrouseus.*)—This invention relates to apparatus for ascertaining the temperature of steam and its power of tension; it is termed a "thermo-manometer," being a thermometer and manometer combined. It consists of a tubular case, which partly

encloses a scale plate, marked on one side of a mercury tube which rises up the face of the plate, with degrees indicating temperature and power of tension, and on the other side with degrees indicating pressure in pounds, the one bearing a proportionate relation to the other. The bottom of the casing is strongly formed, with a hole in the centre through which the lower end of the tube is passed; a screw thread is cut round the bottom, and the hole in the boiler plate, into which it is screwed, is tapped with a corresponding thread. The bulb hangs below the bottom inside the boiler, where if desired it may be protected by a perforated pipe. As steam is generated in the boiler, the mercury rises in the tube, and indicates on one scale the temperature of the steam, and on the other the pressure in atmospheres or in pounds. The divisions on the scales are arranged from the standard of a normal manometer, in order to ascertain with certainty the true working and sensibility of the instrument. It is stated that "the scale for "temperature may be arranged for the systems 'Celsius,' "'Centigrade,' or other, and for pressure in any other denomination than lbs. English."

[Printed, 8*d*. Drawing.]

A.D. 1863, April 22.—N° 1006. (* *)

BARBER, GILL BRIDGES.—"Improvements in steam boilers." Internal flues are connected with a combustion chamber placed behind the fire-bridge and leading downwards and passing out at the bottom of the boiler. Further on it again rises to form a second combustion chamber within the boiler. After passing out at the back the gases are led along each side; at the front they are led downwards, and then along the under side to the chimney. Inclined water tubes are contained in the combustion chambers. A tubular water heater is placed "between the downtake of the "first" "combustion chamber and the uptake" of the second. A modified form of boiler is made with firing flues at each end and a separate combustion chamber with inclined tubes, the gases being conducted along each side of the boiler to each end, to follow along the under side and pass out at the chimney on one side. A boiler may be extended longitudinally to form space for flue tubes, the gases first passing into an open space at one end of the extended portion of the boiler. On leaving the tubes they pass into another space connected with an uptake.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 24.—N° 1018.

SHEPPARD, John.—(*Provisional protection only.*)—This invention relates to direct acting rotary steam engines applicable to general purposes, and (it is stated) particularly to locomotive engines. It consists of a fixed cylinder closed at each end, wherein fixed upon a shaft which passes through the ends of the fixed cylinder, and concentric therewith, is a small drum cylinder; this cylinder is of such length as to fill the internal space between the ends of the fixed cylinder, but so small in diameter as to leave an annular space around it; projecting radially from its periphery across the annular space, is a longitudinal piston plate, the ends of which extend to and work against the ends of the large cylinder, and the outer edge of the plate frictions against its inner circumference, so as completely to divide the annular space. On opposite sides of the centre, two semi-cylindrical recesses, extending the whole length, are sunk in the inner surface of the large cylinder, wherein on longitudinal axes parallel with the main shaft are fixed two crescent formed blocks which are mechanically made to revolve at the same speed as the main shaft, but in the opposite direction, their positions being so timed respectively in relation to the rotations of the piston plate, as always to present their hollow faces to receive its outer edge as it in succession passes those diametral points in its revolution. After the plate has passed, the rotating movement of the blocks brings their peripheries against the circumferential surface of the piston drum, and so forms in succession fixed resisting abutments for the steam, which is then admitted, through suitable ports, into the annular space between the movable piston plate and the fixed blocks, the ports for inlet and exhaust being arranged respectively on each side, either port acting as inlet or exhaust according to the required direction of the rotating motion of the piston drum cylinder and shaft. Arrangements are made, when the invention is applied to locomotives, for facilitating the turning of short curves.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 24.—N° 1019.

KNOWLES, John, and JACKSON, Samuel.—(*Provisional protection not allowed.*)—This invention relating to "apparatus for

" heating water in furnaces, flues, and chimneys," "consists of " or in apparatus applicable to furnaces, steam and other boiler " flues, draughts, or chimneys connected therewith, to be in the " shape of a box or boxes, pipe or pipes, tube or tubes, coiled or " otherwise; to be made of any (metal or) material most suitable " for the purpose, and to be placed in any fire, furnace, flue, " draught, or chimney for the purpose of heating water."

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 24.—N° 1024.

THOMPSON, James.—This invention relates to machinery for punching metals; it is adapted to the steam hammer for the purpose of punching plugs out of blank masses of steel, steel iron, iron, or other metal, such blanks to be afterwards manufactured into ordnance, barrels for fire-arms, and other descriptions of tubes, for similar and other uses.

Into the head of a steam hammer is fitted a suitable punch, and into the anvil block, to correspond therewith, is fitted a suitable die, through which there is an aperture, in order that when struck out, the plug may fall through. The blank during the operation is held in position by converging slides, which are fixed to the anvil block, and operated by a left and right-handed screw actuated by tooth wheels set in motion by means of a handle. "The blank thus formed will be a solid tube of any " desired thickness of metal, and capable of being rolled, drawn, " or swaged, to extend its length and reduce the thickness."

[Printed, 8*d*. Drawing.]

A.D. 1863, April 25.—N° 1031. (* *)

CLARK, Albert Henry and HOPE, Henry.—(*Provisional " protection only.*)—"Improvements in valves for water, steam, " and gas."

"We make the seat of the valve in a plane in which the axis " of the pipe is situated, the ingress and egress pipes being placed " on either side of, and opening respectively above and below " the said seat. The valve rises and falls in a line at right angles " to the axis of the pipe. The said valve is fitted to a stem or " axis, the upper part of which is made into a screw. The lower " cylindrical part of the said stem or axis passes through a stuff- " ing box, which is fixed upon and closes the opening in the pipe " at which the valve is introduced; the upper screwed portion of

"the stem or axis works in a concave screw in the plate, closing "the top of the stuffing box." By turning a handle at the top of the valve stem the valve is raised or lowered. The valve may either be faced with leather or india-rubber, or it may be wholly of metal and ground into a conical seat.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 25.—N° 1038.

BEYER, Charles.—(*A communication from Johann Andreas Schubert.*)—This invention relating to safety valves, causes the valve to lift much higher than the ordinary safety valve, so soon as the lifting steam pressure is superior to the weighting of the valve.

It consists "in forming a flange round the valve commencing "at the outer edge of the valve facing, which flange is undercut "and concave in shape, and the concave side is towards the "seating of the valve, which has also a flange upon it com-"mencing at the outer edge of the valve seating, but the upper "surface of the flange is convex and corresponds nearly to the "concave surface of the flange upon the valve. There is a "slight space between the concave and convex surfaces of the "two flanges, which diminishes towards the outer edge of the "flanges. When the steam begins to escape from between the "surfaces of the valve it gets between the concave and convex "surfaces of the two flanges, and its force thus acts upon a "larger area and reacts upon the concave surface of the valve, "and causes it to open to a greater extent than the ordinary "safety valve." Additional apparatus is employed to close the valve so soon as an equiponderance is established between the reduced steam pressure and the weight upon the valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 27.—N° 1052.

JEFFREYS, Julius.—(*Provisional protection only.*)—This invention, relating to surface condensers and apparatus for heating and cooling fluids, consists in the employment of thin copper or other metal plates, pressed or stamped with numerous parallel flutes and intervening flat ridges. These plates are placed face to face in pairs, so that the flat ridges of one plate, face to the flat ridges of the other, strips of soldering or brazing metal being placed between, whereby a series of tubes is formed by the two plates. These coupled plates are then placed one pair upon another with a suitably fluted cast iron plate disposed between each pair,

thereby forming a pile, which is first subjected to pressure, in order to force the faces of the ridges and soldering metal in close contact; the pile is then heated by suitable means until the soldering metal fuses and unites the ridges, and thus is formed between each pair of plates a parallel series of separate tubes. These duplex plates are suitably arranged in the condenser case, in such manner in connection with separate passages, that the steam passes through the tubes and the condensing water flows between. In order to prevent the clogging or coating of the inner surface of the tubes by greasy or other adhesions, the lubricant employed for the moving parts of the engine, is sufficiently alkalized as to render it partially soluble in water. A mode of cleansing the tubes is adopted, and wire gauze used to intercept particles of organic or other matter. The apparatus may be also adapted to the heating or cooling of fluids, and for ventilating and heating rooms and buildings. It is also applied to heating feed water for boilers. When flame and the heated products of combustion are directed through the tubes, their ends are bell-mouthed, and the front plate sheltered from the fierce action of the fire, by protection plates of a suitable material.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 30.—N° 1092.

STEWART, Charles Patrick, and KERSHAW, John.—This invention relates to "engines, machinery, and apparatus for "obtaining compressed air, and for applying the power thereof in "propelling railway and other carriages." The air is compressed to the required degree, by the successive operations of the combined apparatus, which actuates a body of water, whereto reciprocating motion is imparted by a piston in a horizontal cylinder, actuated by the power of a duplex steam engine, the cylinders of which are disposed, in relation to each other, at an angle of 90°. The periphery of the piston in the water cylinder is covered with wood. Each end of the cylinder is connected to a vertical chamber, wherein the water simultaneously rises in one chamber and falls in the other, alternating as the motions of the piston in the cylinder are reciprocated. Suitable inlet and outlet air valves are fitted to the upper part of each vertical chamber; the air forced through the outlet valve is conveyed to the next section of the apparatus, which together with the other sections are of gradually decreasing dimensions. The volumn of the air is gradually reduced by the successive operation of each section, passing from the first to the

second and so on to the last, and thence into a receiver or reservoir. The engine for applying the power of compressed air to the propulsion of railway and other carriages, is somewhat similar in the mechanism to a locomotive worked by steam, but in the place of the boiler and furnace, a series of cylindrical reservoirs, connected with each other by suitable pipes, is disposed along the centre of the engine framing. Each reservoir may have a separate pressure gauge, and suitable valves provided for opening the communication with the first or high-pressure cylinder, whence the compressed air after having operated the piston therein, is exhausted into the second or low-pressure cylinder, which is of larger dimensions; other cylinders may be used, so as to completely exhaust the expansive force of the air. The area of each piston is relatively proportioned to the expansion, so that the power of each is about equal. The air is admitted to the high-pressure piston at its full pressure without throttling, and the speed of the engine is regulated by varying the cut-off without altering the eduction valve, or effecting either of the valves of the low-pressure cylinder. Stationary air-compressing engine-houses must be provided at intervals along the line of road.

[Printed, 1s. 6d. Drawings.]

A.D. 1863, April 30.—Nº 1094.

JOHNSON, John Henry.—(*A communication from Wilhelm Heinrich Christian Voss.*)—(*Letters Patent void for want of final Specification.*)—This invention relates to that class of rotary engines in which two discs set in relation to each other at different angles, are rotated (without the intervention of toothed wheels on their peripheries) by the direct action of a series of cylinders and pistons attached to each disc respectively and circumposed on the contiguous face of each. The affixture of the cylinder ends to the face of one of the discs, and of the ends of their piston rods to the face of the other disc, is effected by ball and socket joints, in order that they may not be restrained or impeded in their action, by the constantly changing direction of their motions in relation to the surfaces of the revolving discs. By coupling the shafts (on which the discs are mounted) by bevelled toothed gearing according with the angle of the discs, the machine is greatly simplified. The driving pulley for giving off power, is mounted on the shaft of one disc, and the other shaft actuates a governor. It is proposed to make these engines with double as well as with single action, by arranging steam ports in both discs,

and providing each with a stationary slide valve, against which the discs will revolve. These slide valves are divided into three compartments by diverging partitions, one to anwer to the steam inlet, another for the exhaust, and the third for the cut-off. In some cases the engines are to be constructed as condensing engines, and provided with condenser, and air, cold water, and feed pumps.

[Printed 4*d*. No Drawings.]

A.D. 1863, May 1.—Nº 1095.

GRAY, JOHN MCFARLANE.—This is an invention of portable apparatus for rivetting, caulking, chipping, and operating on metals and other substances, and in operations embracing, amongst other things, quarrying, mining, tunnelling, forging, stone dressing, ore stamping, and gold beating. The objects to be obtained are as follows:—

1st. The lessening of the bulk and weight of such impact machines, in order to render them more applicable to general work; also, in contradistinction to the steam hammer, fitting the hammer head or striking part into the end of the cylinder, so as to form a loose end, not rigidly connected either to the cylinder or piston, which in itself is an "independent bolt or hammer of "suitable weight traversing back and forth shuttle-like, in the "cylinder, and communicating its force to the hammer head by "impact within the cylinder. By this arrangement the hammer "head is almost stationary, and therefore the length of the "machine is much reduced, and the hammer head can be kept "in contact with the material to be operated upon, which is an "advantage in certain kinds of work. This loose end of the "cylinder may be either a 'hammer head' or 'tool head' or "'tool holder' or a 'swage' or other tool."

2nd. Relates to slide valves, and the modes whereby in such impact machines they are caused to operate self-actingly at each stroke of the piston. Three modes are described. The first operates by means of inside tappets; the second is an arrangement for moving the valve in one direction by an inside tappet, and in the other direction, by the direct action of steam on a piston connected with or forming part of the valve; and the third, by the direct action of steam on such piston, so as to move the valve in both directions.

3rd. Relates to the adaptation of such portable impact machines to the rivetting operations connected with the construction of iron ships, bridges, and similar metallic structures.

4th. Adapting the invention to the operation of chipping, caulking, planishing copper plates, thinning the edges of copper plates, and for use as a portable steam hammer.

5th. Combines in one portable apparatus mounted on wheels, a convenient boiler with feed injector, and a rivet hearth, fitted so that one furnace serves both boiler and hearth, the steam from the boiler being conveyed to the impact machine through a flexible pipe. The details of machines variously modified to suit different operations, are described and illustrated.

[Printed, 2*s*. Drawings.]

A.D. 1863, May 1.—N° 1098.

CRAIG, William Grindley. — This invention relating to apparatus for feeding steam boilers, is constructed with certain alleged improvements on the principle of "Giffard's injector," and consists of a water regulator, free to be moved in the interior of the water chamber by a rack and pinion or other mechanical contrivance; it is separated from the steam funnel by an intervening annular space, terminates in a trumpet mouth, and is opened and closed by means of the spindle valve; the suction takes place in a tube wherein the water and steam mingle. The apparatus is connected to the boiler by a steam passage, and to the water supply by an inlet pipe. When the regulator is drawn sufficiently far back by the rack and pinion, the feed water can enter the funnel, where on drawing back the spindle the steam creates the suction, thus opening the tuyere. The piston, with its various packings is entirely dispensed with in this invention, which possesses the means of independently regulating the water supply by the regulator, and the steam by the valve, which two parts can work quite independent of each other. The regulator is so arranged as to isolate the water chamber from the steam funnel. The annular space prevents priming by separating the water chamber from the steam, and so preserves the suction, the stoppage of which is common to most regulators of this class.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, May 4.—N° 1114. (* *)

APPLEGATE, Frank. — (*Provisional protection only.*)—"Im-
" provements in spring balances and pressure guages."

This invention is thus defined:—

"Spring balances and pressure guages may be said to be one and
" the same thing, being applied in the one case to determine the

" pressure produced by gravitation, and in the other the pressure " of steam or other elastic fluid under pressure. Instead of using " dial and index hands or pointers pointing to the graduations on " a disc or other dial plate in these instruments, I make the dials " or indicators of such apparatus of a plain opaque surface cover- " ing the graduations of the dial, which are visible through an " opening, glazed or otherwise, through which the reading of the " guage is obtained, such opening passing over the graduated " dial or surface, either of a circular or of a lengthened form, and " the indicator (that is, the plate with the opening) either rotating " or moving in a direct line as usual."

[Printed, 4*d*. No Drawings.]

A.D. 1863, May 6.—N° 1135.

STURROCK, ARCHIBALD.—This invention relates to locomotive engines and tenders. The object of the inventor being mainly to utilize the adhesion of the wheels of the tender upon the rails, by converting it into an auxiliary engine, for which purpose small cylinders are fitted thereto, so as by their connecting rods to actuate the wheels in the usual manner, all or some of which may be coupled. Steam is supplied from the boiler of the locomotive through suitable tubes. A condensing chamber is formed under the tank of the tender, into which the auxiliary cylinders exhaust, or if otherwise, through a double series of pipes submerged in the tank, which act as a surface condenser on the exhaust steam; the portion of steam which escapes condensation is allowed to issue into the atmosphere through suitable pipes bolted to the sides of the tender, the water of condensation running back into the tank.

[Printed, 10*d*. Drawing.]

A.D. 1863, May 6.—N° 1136.

ATKINSON, CHARLES WILKINS. — (*Provisional protection only*).—This invention relates to steam engines, in which by a certain arrangement, the ordinary reciprocating action of the piston is converted into rotary motion without the intervention of a crank or other similar mechanism. The inventor states that his arrangement " consists in bringing pressure to bear alter- " nately on either side of an enlarged head, or on either of two " surfaces carried by the piston rod, the rotating shaft which is " to receive the converted to-and-fro motion being between such

"surfaces, and having on either side thereof the apparatus to "receive the to-and-fro motion. The drum or friction surface "on the rotating shaft I prefer to be formed in rings alternately "of different diameters to take into correspondingly formed "surfaces carried by the piston rod, so that the surfaces in con- "tact will be similar to what is commonly known as Robert's "friction gear. The pressure exerted upon the friction surfaces "may be obtained alternately by the pressure of the steam, or "the force exerted by the vacuum on either side of the piston."

[Printed, 4*d*. No Drawings.]

A.D. 1863, May 7.—N° 1146.

DAY, CHARLES ARTHUR, LAMB, ANDREW, and SUMMERS, THOMAS.—This invention relates to steam engines, and consists in employing the ordinary air pumps of marine engines in connection with surface condensers, in such manner that one pump shall draw off the water of condensation, and the other the sea or condensing water which it discharges outside the vessel. The surface condensers are disposed on the engine bed plate, and discharge the water of condensation through suitable passages into one of the air pumps, which lifts it into the hot well, whence it is forced either by the air pump or the feed pumps into the boilers; the other air pump drives sea water by means of suitable pipes into the condensers whence, after flowing and circulating amongst the tubes, it is discharged into the sea by the same pump. Valves are provided for regulating the flow of water through the surface condensers, and valves and cocks are fitted thereto for the purpose of condensing by injection in case of defects in the tubes or shortness of feed water.

[Printed, 1*s*. Drawing.]

A.D. 1863, May 7.—N° 1147. (* *)

THIERRY, JEAN BAPTISTE PIERRE ALFRED.—"Improve- "ments in the arrangement or construction of furnaces to "render the combustion of the fuel more complete, and to "prevent the emission of smoke therefrom," which consist in "blowing in against the bridge of the furnace" "from the front "of the fire-place, through one or several jets, superheated dried "steam," "at a temperature of about 300° to 600° Fahrenheit. "Sometimes" atmospheric air is blown in in combination with the steam by placing an open pipe at the side of the steam jet.

The superheating of the steam "is obtained" "either by "means of a worm, which is placed in or near the fire-place of "the furnace, or by means of a distinct" apparatus. "The "steam is drawn from the dome or steam chest of the boiler, a "pipe brings it down into the superheating apparatus, which "delivers it to the blowing" pipes.

In applying "dry steam blowing apparatus to a common "steam boiler furnace, a pipe with suitable valves brings the "steam down to the superheating apparatus, which consists of "a coil of pipes extending more or less along the fire-place of "the furnace." "The coil ends in a horizontal tube parallel to "the front face of the furnace, and placed inside the fire-place "just above the door of the furnace; this tube" "is bored on the "side which faces the fire with one or several holes," "provided "with jet pipes."

"In locomotive boilers of the ordinary form" "a hollow seat "is bolted over the entrance of the fire-box against the inside face "of the boiler, with which it is made to communicate; the "superheating pipe is placed on the seat." New boilers are made "with suitable recesses in the inside face for receiving the "superheating pipe or pipes."

In puddling and reverberatory furnaces "a large pipe" "is "lodged in the masonry of the furnace, its outer end receives "the blow-pipe from the superheating apparatus, and an open "pipe, which may, however, be closed at its outer end; this "latter admits, when open, atmospheric air to the furnace." "The inside end of the large pipe has one or several holes or "splits."

In steamers and locomotive engines the blow-pipe may be placed outside the furnace and a "hollow cross bar, with ways for "the jet pipes of the blow pipe, is lodged inside the front casing "of the boiler over the fire-door, and when it is requisite to apply "the blast the jet tubes are merely placed through the ways in "the cross-bar, the end of the feed-pipe being then screwed on "either end of the blow-pipe."

"When dry steam has to be provided to several fire-places," "the apparatus consists of a worm" "enclosed in a metallic "casing lined with fire-bricks" "heated by a fire placed under-"neath the middle part of the worm, along which the produce "of the combustion ascends into a chimney; the steam is sup-"plied to the worm," "and passes as dry superheated steam to

"another pipe provided with suitable cocks and pipes to screw "on to the blow-pipes. On the exit pipe is branched a smaller "tube, through which the necessary supply of superheated "steam is fed to the blow-pipes."

[Printed, 1s. 6d. Drawings.]

A.D. 1863, May 8.—N° 1149.

LIVSEY, PETER JOEL.—(*A communication from Levi Leigh.*)—This invention relates to a mode of compounding beam steam engines, by so connecting the piston of the high-pressure cylinder with the beam, that it shall have a longer stroke than the piston of the low-pressure cylinder; or, in so combining the high and low-pressure cylinders, that the piston rod of the former shall be connected to one end of the beam, and the piston rod of the latter to the opposite end, the upper end of the main connecting rod being jointed to the beam between the connection of the high-pressure piston rod and the fulcrum, and the lower end coupled to the crank. For the purpose of increasing the power of a single cylinder low-pressure beam engine, a high-pressure cylinder is disposed in a line with the beam, beyond the sweep of the connecting rod and crank, and the beam is lengthened to receive the auxiliary power of the high-pressure cylinder, by securing side plates to the beam, which extend sufficiently far beyond its primitive length, to make the connection with the high-pressure piston rod. In place of a fixed high-pressure cylinder, one of the oscillating class may be applied to the lengthened end of the beam. After the steam has operated the high-pressure piston it is conducted through suitably arranged passages to be reworked in the low-pressure cylinder.

[Printed, 10d. Drawing.]

A.D. 1863, May 8.—N° 1159.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Francis Bowes Stevens.*)—This invention relates to steam engines, and consist (1) "in diminishing the amount of surface required "in a cooler without impairing the vacuum in the ordinary or "common condenser of the engine, and this is done by com-"bining a cooler with a double eduction. This combination is

"made by delivering into an additional condenser the steam dis-"charged from the cylinder by the first eduction, and by deliver-"ing the water from this additional condenser into a cooler at a "temperature higher than that maintained in the ordinary or "common condenser, and by delivering into the ordinary or "common condenser the steam discharged from the cylinder by "the second eduction, the difference between the average tem-"perature of the water to be cooled and that of the cooling "water is thus increased, and the amount of cooling surface "required without impairing the vacuum in the common con-"denser thereby diminished." (2) "consists in simplifying the "apparatus that condenses the steam discharged by the first "eduction from the cylinder of a condensing steam engine by "closing the hot well of the engine against the atmosphere, and "by keeping a portion of the space of the hot well free from "water, and by delivering the steam discharged from the cylinder "by the first eduction into the hot well, so that it may be con-"densed or partially condensed by the water delivered by the air "pump into the hot well. The hot well is thus made to act also "as an additional condenser, and dispenses altogether with an "additional air pump to draw the water from the additional con-"denser. This apparatus can be used in connection with the "first part of the improvements, or it can be used when it is "desired to heat the feed water by the steam discharged from the "cylinder by the first eduction." (3) "Consists in simplifying "the machinery for discharging the steam by the first eduction "from a port made mid-way in the length of the cylinder, and "from the steam or induction side of the piston, by dispensing "with the valve moved by the mechanism of the engine to open "and close this port; this is done by so arranging the relative "proportions of the length of the stroke of the piston, and of the "depth of the piston and its packing, and of the width of the "port made midway in the length of the cylinder that this port "shall not be uncovered by the piston until that part of the "stroke is attained at which it is desired to withdraw the steam "through the port, thus making the piston act as the valve to "open this port. By the term width of the port is meant the "measurement of the port in the direction parallel to the axis of "the cylinder."

[Printed, 1s. 10d. Drawings.]

A.D. 1863, May 9.—N° 1160.

THOMSON, William.—This invention relates to obtaining motive power, applicable in part to raising and forcing fluids into steam boilers, tanks and vessels. It consists of a rotary double wheel or wheels, fitted and caused to rotate in suitably formed closed cases, wherethrough steam or other elastic fluid is made to pass. The first is denominated the "motive wheel or motor," and the second the "impelling wheel or impeller." The former is operated by the expansive force of the steam or fluid, and the latter operates upon the liquid required to be raised or forced. The motor wheel is mounted upon a shaft and enclosed in a well fitting case; it is furnished with a number of curved radial blades, upon which the impulsive force of the current of steam is so directed as to cause its rotation; the shaft of the wheel projects outside the case when the power is given off. When applied to raise and force water into steam boilers and vessels, the end of the shaft is enclosed in another compartment, and the impelling wheel is fixed therein; it is furnished with helical formed blades, and receives its motion from the motor. The chamber containing the impelling wheel is placed in communication with the reservoir in one direction and with the boiler in the other, the wheel being interposed; the water is drawn up by the suction as the current is forced on towards the lower part of the chamber, which terminates in an inverted coniformed nozzle, the end of which is exactly opposite and close to a bell-mouthed pipe leading to the boiler; within the inverted nozzle, another of the same form descends, leaving a thin conical space between; the water is driven through this space by the impeller wheel and, aided by the force of a jet of steam which issues from the inner nozzle, the water is compelled or induced to enter the bell-mouthed pipe and thence into the boiler. Both wheels may be combined in the same case.

[Printed, 10*d*. Drawing.]

A.D. 1863, May 9.—N° 1175.

JOHNSON, John Henry.—(*A communication from Enrico Fava.*) —(*Provisional protection only.*)—This invention relates to rotary engines, wherein are employed two pistons, each filling about one-fourth of an annular steam space formed round the main axis, on which they loosely work inside the cylinder, and are each con-

nected by a long collar or boss, with a disc outside, on the peripheries of which are diametrally formed on each disc, two ratchet teeth or notches, which engage with a fixed detent, for the purpose of alternately preventing the rotation of the discs and corresponding pistons in a backward direction. The steam is admitted between the contiguous faces of the two pistons by separate passages longitudinally arranged in the main axis; these passages communicate with lateral passages. The steam inlets are governed by a disc valve attached to the end of the shaft or axis, exposing or opening only one passage at a time as the shaft revolves, and acting also as an expansion valve. The pistons alternately perform half a revolution, after which each in succession is held by the detent, thereby presenting to the other while it operates a rigid resisting surface against the force of the steam. The shaft is thus continuously carried round by the alternate semi-revolutions of the two pistons; the inlet and exhaust ports being suitably arranged and brought alternately coincident with the steam and exhaust passages by the rotations of the shaft.

[Printed, 4d. No Drawings.]

A.D. 1863, May 15.—Nº 1220. (* *)

SHILLITO, BENJAMIN, and MOOR, DAVID.—"Improvements "in generating heat and motive power." A steam boiler furnace is made air-tight; the air required is forced in heated and under pressure; the escape of the products of combustion is regulated by valves; and a double hopper is used for feeding in the fuel. The fire gases are themselves passed into the boiler and mixed with the steam for driving the engine; or the fluid mixture may be injected into the water of a second boiler in order to be employed in generating steam.

[Printed, 8d. Drawing.]

A.D. 1863, May 16.—Nº 1233.

CLARK, WILLIAM.—(*A communication from Adrien Jules Alexis Dumoulin.*)—(*Provisional protection only.*)—This invention relates to rotary engines, within which a constant stream of steam or other elastic fluid, is discharged in succession into spaces, each one progressively larger than the preceding, so that the pressure of the fluid as it courses from space to space, is gradually diminished. The engine consists of a disc mounted upon a horizontal

shaft, which is tubulated from one end to about its mid-length, where a lateral passage opens a communication with the interior of the disc, within which, commencing a certain distance from the axis, is formed a series of concentric annular spaces; these spaces from the smallest in diameter to the largest, communicate with each other in succession. The steam current flows from the tubular shaft by a diverging passage into the smallest annular space, whence after coursing round about three-fourths of its circumference, it passes through an oblique passage into the next surrounding space, and so on in succession from ring to ring, or space to space, coursing about three-fourths round the interior of each, until the outside space is reached, whence the nearly spent steam returns by narrow converging passages, formed in the back of the disc, towards the centre, where it finally escapes into the atmosphere or into the condenser. The passage of the steam in one constant direction through the annular spaces in succession, causes the disc to rotate.

[Printed, 8*d*. Drawing.]

A.D. 1863, May 16.—N° 1239.

WHITEHEAD, JAMES.—The object of this invention is to supply a substitute for the ordinary stuffing boxes employed in the construction of hydraulic machines, steam engines, and other machines working with pistons, thereby to avoid or reduce friction. The inventor states as follows:—" The piston, plunger, or ram, I " form less in diameter than the bore of the cylinder in which " it works, and to the bottom of each ram I affix a piece or " pieces of leather as a tube of semicircular form inside its lower " or outer edge. Inside this tube, and on a rod screwed into the " bottom of said piston or ram, I place loosely a spherical or " conical shaped piece of metal, which when pressed against by " the water forces the edge of the leather outwards and causes " same to fit the cylinder water-tight. I propose to form the " said cylinder of a solid square piece of metal bored out at its " centre and open at top (having no stuffing box) to receive the " rams; said cylinders are fitted in an oblong cistern containing " water; two or more small pumps, fitted with suitable valves, " are also fitted in said cistern, and said pumps are worked by " cranks or excentrics mounted on a shaft for injecting water into " the square cylinders aforesaid for lifting the rams and imparting

"motion to a long lever, an antifriction roller being adapted to "the head of the rams upon which said lever rests. This lever "has its fulcrum on a strong pin fixed in a standard, and the end "of said lever is connected to the pump rod leading down the "shaft of the mine, pit or other place from which the water is to "be raised; or the power may be transmitted by pullies and "bands, or spur or bevil gearing, to the machinery to be "driven."

"In adapting the piston above described to the cylinders of "steam engines I propose to use a band of steel or other suitable "metal instead of leather."

[Printed, 1s. 4d. Drawings.]

A.D. 1863, May 18.—N° 1243.

HEATHER, Alfred, and REDFERN, John.—This invention is supplementary to letters patent granted "for improvements in "the construction of steam boilers" to John Redfern, bearing date February 23, 1860, No. 495. The present invention is applicable to the boilers of marine, locomotive, and stationary engines, and consists,—

1st. in forming the tube plate situated at the front of the boiler, angular or curved towards the side flues, instead of flat or square with the side flues, as formerly described. The advantage gained by this change in the tube plate, is an increase of draught in the flues of multitubular boilers.

2nd. relates to constructing such boilers with a central flue, extending the whole length from end to end, in combination with the constructive arrangements of multitubular boilers described in the former Specification. By these combinations (it is stated) complete combustion of the smoke is effected without extra appliances; the tubes being kept free from smoke, renders the boiler more durable, whilst great economy in the consumption of fuel is obtained. The illustrations and descriptions extend to marine boilers for vessels of light draught, a marine boiler for the naval service, a 30 H.P. high-pressure stationary boiler, a boiler adapted for heating or puddling furnaces employed in the manufacture of iron, and another modification of the latter which it is proposed to fit with ventilating smoke doors, regulated by a rack and valve.

[Printed, 3s. 4d. Drawings.]

A.D. 1863, May 23.—N° 1292.

STURGEON, John.—The object of this invention is "to render the valve gearing of steam hammers self-acting and self-regulating, so that the valve will adapt itself to the variations in the length of stroke of the hammer consequent on the variations in the thickness of the material under operation." To effect this, the valve gear employed for reversing the valve for the up-stroke, is caused to follow the motion of the hammer, so as to be always in a position for reversing when the hammer strikes, the jerk caused by the impact of the blow, giving the necessary motion to the valve. A few of the various ways in which this invention may be applied, together with some of the various arrangements of apparatus suitable in this case for reversing the valve for the down stroke, are shown and described.

According to the first arrangement represented, when the hammer strikes the object on the anvil, the end of a link is simultaneously thrown into a forward position by the concussion of the blow, whereby a lever is lifted, which depresses the valve rod and reverses the valve. As the hammer ascends, the end of a rod is brought against a stop, which acting through a spring, forces down the lever and raises the end of the link to its former position. The stop may be fixed when only a short stroke is required, or carried on an adjustable plate, in order to admit of any required variations in the height of the fall. Means for working the valve by hand, or for striking a "dead blow" are provided.

[Printed, 10*d*. Drawing.]

A.D. 1863, May 26.—N° 1322.

MUNRO, James, and SCOTT, Robert.—This invention relates to a working engine, or "steam chamber piece," combined with apparatus for boring, mining, excavating, cutting, and winding; it also relates to pressure gauges. There is an essential difference in the construction of the apparatus, when employed for vertically boring from the surface with rods, as compared with the necessarily modified arrangements, required for sinking mine shafts, and cutting and excavating minerals. The former consists of an upright standard, beneath which on an inclining frame, is disposed a steam winch, comprising a pair of small engine cylinders, the pistons of which, by means of connecting rods, rotate

the crank shaft, which by means of toothed gearing actuates the winding-up barrel. This winch is employed for the occasional raising and lowering of the rods, which are severally detached as they are brought up, and again screwed end to end together when let down, the pulleys over which the ends of the winding-up rope, after being coiled round the winding drum, are passed, being suspended at the top of the standard frame by a spring attachment. Both ends of the rope are, by reversing the action of the drum, caused to wind alternately. The necessary vertical reciprocating or jumping motion is imparted to the rods when in operation by a "steam chamber piece," which is cylindrical and contains two concentric segmental chambers, wherein are fitted pistons, which by the pressure of steam are caused to act in the direction of the segmental curve, and by means of studs which pass out through segmental slots, impart a reciprocating movement to a cylindrical casing which concentrically surrounds the "steam "chamber piece." The connection between the cylindrical casing and the upper end of the series of rods, is effected by means of a strap, which depends from the casing immediately over them. A vertical boiler with two compartments, to contain steam of different degrees of pressure, is mounted on a wheel carriage, and employed to generate steam, the pressure of which is constant upon one of the pistons, which acts as a counterpoise to the weight of the rods, the other piston imparting to them the jumping motion.

Modifications of apparatus mounted on wheels for excavating and cutting minerals, are described and illustrated. In these arrangements the "steam chamber piece" is employed to operate oscillating picks and cutters, so as to form grooves in the face of the working for receiving wedges or bars, which driven in, detach the intermediate mass.

The pressure gauge operates by means of a small piston, one end of which is exposed to the steam pressure. A set of levers bearing upon each other are acted upon in succession, the last, by means of a wheel and pinion, giving motion to the indicating finger.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, May 27.—N° 1331.

COULTHARD, HIRAM CRAVEN.—This invention relates to the valves, and the ingress and egress parts and passages of the air

cylinders of blast engines. Around each end of the cylinder is formed a closed annular egress passage; these respectively communicate with the blast passage in one direction, and with the interior of the cylinder in the other direction by means of (at each end of the cylinder) a circumposed series of round holes. Upon the upper end or cover of the cylinder is another annular passage, opening to the atmosphere through a series of orifices formed at intervals all round it; this passage also communicates with the interior of the cylinder through an annular series of round holes or inlets drilled at close intervals through the cover. Inside the bottom of the cylinder there is an annular recess or passage covered by a perforated plate, and divided to form an annular series of cavities for the reception of small spherical valves, which cover an annular series of corresponding holes drilled through the bottom of the recess and opening downwards to the atmosphere. The valves both for the ingress and egress of the air, consist of small round balls of india-rubber or other elastic material, which are loosely placed in perforated guards or cavities formed within the respective passages, so as to enclose each hole, the sides inclining in such a manner that the ball valves have a constant tendency to roll over and cover the holes. When by the reciprocating motions of the piston the air is alternately drawn into the ends of the cylinder, the ingress valves are severally lifted from their seats, whilst the corresponding series of egress valves close against the back pressure; these in turn are pressed away from their seatings by the return action of the piston, at the same time that the inlet passages are closed by the internal pressure upon the inlet valves. The above is an arrangement applicable to an upright air blast cylinder.

Several modifications are shown and described; these relate to various arrangements and plans for constructing the annular passages, applicable to cylinders, both vertically and horizontally disposed.

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1863, May 28.—N° 1336. (* *)

ELLIS, WILLIAM IRLAM.—(*Provisional protection only.*)—" Im-" provements in steam boilers," consisting in forming the longitudinal joints of their cylindrical parts " at or near the top above " the level of the flues, tubes, or brickwork in order that such

" joints may be more easily accessible." Fire-boxes of locomotive and other similar steam boilers having internal ones are constructed " with an enlargement of the width " " at or near the top " so as to obtain more space for the flue tubes.

[Printed, 4*d*. No Drawings.]

A.D. 1863, May 29.—N° 1351. (* *)

PÔTEL, Jerome Jean.—" Accelerating the draft in furnaces " and fire-places " by causing the products of combustion to pass through a flue heated by the fire itself. Vertical and horizontal steam boilers, a ship's cooking stove, and a house stove are shown with a portion of their main flues in direct contact with the space in which the fuel is burnt.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, June 1.—N° 1371.

COULTHARD, Hiram Craven.—This invention consists in packing the stuffing boxes of piston and other rods and parts of mechanism, for the purpose of preventing the escape of steam, with wood shavings and saw-dust, saturated or mixed with oil or grease. A layer of fine wood shavings is first pressed into the stuffing box, which is then filled up loosely with saw-dust, and pressed down with the gland, which being withdrawn a limited quantity of oil or tallow is poured in; next follow with another layer of fine shavings, which press down and add more tallow or oil, upon which put more saw-dust and press down; then add a little more oil or tallow and a top layer of shavings which completes the packing, upon which screw down the gland. Either shavings or saw-dust alone with or without oil or tallow may be used. When additional or repacking is required, it is not necessary to remove the remains of the old, which gradually wears away and disappears.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 2.—N° 1377.

BARRETT, George Allam, EXALL, William, ANDREWES, Charles James, and BARRETT, Alfred.—(*Partly a communication from Frederic Perry.*)—This invention relates to valves and apparatus for regulating the speed of steam engines. (1.) It consists of a steam box and slide valve working as usual on-

the cylinder port surface, with which the ports in the face of the valve correspond. The steam enters the cylinder ports through the valve from the back, which is covered with an expansion plate valve, the movements of which open and close the ports in the slide valve; the two valves are pressed together by springs so that they move simultaneously until the plate valve is stopped by coming in contact with internal projections, respectively on each end of the steam box; the slide valve then finishes its movement alone, during which time the steam ways are entirely closed, and those at the other end opened for the return stroke. A cam piece, which is operated by the governor, is attached to the end of a spindle which passes into the steam box through a stuffing box in the centre of the cover; this cam piece acts against projections upon the plate valve, and so shifts it as to increase or diminish the supply of steam in relation to the normal speed of the engine during the movements of the slide valve. (2.) Relates to apparatus for equalizing speed. Two fly wheels are fitted so that the rim of one is partly enclosed by the rim of the other; one wheel is fixed upon the crank shaft, the other is loose upon the shaft but is driven round by the pressure of a series of springs attached to the fixed wheel. Power is given off by the loose wheel by means of a strap or otherwise; the relative position of the wheels varying in proportion to the inequality of the resistance is made to operate upon the expansion valve, and thereby regulate the speed of the engine.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, June 2.—N° 1383.

GLEAVE, William, and YOUNG, Thomas.—(*Provisional protection only.*)—This invention relates to apparatus for supplying feed water to steam boilers, which consists of "an outer " casing or tapering cylinder, which is attached to the boiler by " means of a pipe or hollow connection; the upper end of this " casing is separated from the lower by a disc valve so as to form " a water chamber or reservoir at the top, and this chamber is " connected with the water inlet pipe. In the centre of the outer " casing are a series of hollow cones, one placed below the other, " gradually diminishing in size, and connected together by a " central tube which terminates near to the point of connection " with the boiler. The apex of all the cones are placed upper- " most and the bottoms are perforated, so that when steam is

"supplied by means of a pipe to the apex of the top cone there "will be a continuous course of numerous jets of steam down to "the narrower end of the casing. The disc valve supplies the "water by a number of tubes on to the exterior surface of the top "cone, and the jets of steam impel the water down on to the "next cone, and so on until the water has received sufficient "momentum to enable it to enter the boiler, its return being pre- "vented by a valve opening inwards only. The stream of water "and steam down the lower part of the casing causes sufficient "vacuum in the upper chamber to lift water from a lower level." The same effect may be produced and worked in a horizontal position by the employment of a single inverted perforated cone, enclosed within a correspondingly formed conical case, internally provided with a series of projecting ribs to convey the water into position to be acted upon by the jets of steam.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 3.—N° 1384.

TRAVIS, John.—This invention relates to the use of certain vegetable and chemical ingredients for preventing the incrustation of earthy matters in steam boilers, which consists in introducing into the boiler at the man-hole, or into the feed water tank or reservoir, carrageen or Irish moss, silicate of soda, or arseniate of soda, or phosphate of soda, each of which singly or compounded with the rest "will prevent incrustation." The particles of earthy matter in the water are precipitated, and may be washed or swept away when the boiler is blown off. The necessary quantity of ingredient or compound must be determined by experiment, as it necessarily depends upon the state of purity or impurity of the water supply. Ordinarily from six to eight pounds weight per week of Irish moss will suffice for a boiler of 40 horses' power; the like weight of either of the other ingredients may be used either singly or compounded. The sole use of Irish moss is recommended by preference, especially in new boilers, and also in old ones after former incrustations have been cleared off.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 3.—N° 1388.

LEE, Wellington, and WINTER, John Gano.—(*A communication from Joseph Garnett Larned.*)—(*Provisional protection*

only.)—This invention relates to steam fire engines, and comprises "the novel construction of a boiler and pump, and to so "forming and arranging the different parts of a steam fire "engine as to combine strength, durability, and efficiency with "lightness and simplicity, and consequently cheapness of con- "struction." An upright tubular boiler is employed; "the "tubes terminate at a considerable distance from the upper end "of the boiler, in a chamber upon which is fixed the smoke pipe "or flue, the bottom of which is submerged. The cover or top "of said chamber is secured to its circular sides by means of "screw bolts, and has a central perforation to admit the smoke "into the flue. The cover or top of the boiler is fixed to its sides "and to the smoke pipe by similar means. This form of con- "struction economizes heat, while the covers may be readily re- "moved for the purpose of repairing or replacing the tubes." The pump is constructed with a double cylinder, between which the annular space is divided to form induction and eduction chambers, a valve or cock being interposed to enable the engine to run at a high rate of speed, whereby a large engine may be employed to throw with uniformity a small stream of water without the aid of a fly wheel, which is desirable when the water supply is deficient. Cast to the outside cylinder is a vacuum chamber, which being bolted to the boiler, answers as a pillow block bearing for the rear of the crank shaft, and so forms together a part of the supporting frame. The steam cylinder and valve box are cast together and secured to the boiler by the latter, which dispenses with steam pipes. Two hollow arms extend from the steam box and pump cylinder, and terminate in a hollow standard. The lower part of this standard contains a spring which rests on the axle, and the upper part is enlarged and forms an air chamber. The hollow arms constitute part of the frame; they conduct the water to the discharge hose, and support the pillow block bearing. The fuel box is fixed at the rear of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 4.—N° 1394.

RIGBY, Hugh.—The object of this invention, which relates to steam boilers and furnaces, is to effect the consumption of smoke and economy of fuel. The boiler described is of the ordinary

construction with two internal flues, each provided with a furnace at the front end. The system of alternate firing, and by means of dampers and a suitable arrangement of flues, bringing by turns the products of combustion from the last fed fire into contact with the incandescent fuel in the other furnace, whereby it is consumed, constitutes a part of the invention.

The furnace bars rest upon arched bearers which raise the centre of the grate surface, so that the thickness of the bed of burning fuel gradually increases towards the sides of the furnace, whereon (it is stated) the heat will impinge at a more favourable angle than by the old mode of construction, and consequently the evaporative effect upon the water will be greatly increased, and economy of the fuel result therefrom.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 5.—N° 1399.

CALVERT, FRANCIS ALTON.—This invention relates to steam engines, steam boilers, and steam heating apparatus. As regards engines, the ordinary steam inlet and exhaust ports and passages are dispensed with, in order to avoid the loss of steam contained therein after the ports are closed, and the valves are made to form part of the circumference of the cylinder. The invention is supplementary to prior Letters Patent granted to this inventor, bearing date 21st of October 1861, No. 2625. Two pistons are employed, the upper or main piston occupies in its action about three-fourths the whole length of the cylinder; the rod of this piston works up through a stuffing box, and is attached to a crosshead which slides up and down in vertical guides; the connecting rods attached to the crosshead work down on opposite sides of the cylinder and connect the ends of the crosshead with the throws on the crank below. The lower piston acts as the cylinder bottom to the main piston; it is raised mechanically by a cam which is fixed upon the crank shaft; this cam, at a certain part of its revolution, strikes up one end of a weighted lever, to which by means of a link the lower piston is connected; the opposite end of the lever works the piston in an air pump cylinder underneath, which is in communication with the valve box. The boiler furnace in section is coniform with a hemispherical top, concentrically enclosed within an upright cylindrical shell which is surrounded by a flue circummured by

brick-work ; an enlargement in the diameter of the upper part of the boiler shell forms the top of the flue. The other parts of the boiler are referred to as described in the Specification of a patent granted to this inventor bearing date 14th September 1860 No. 2218. The steam-heating apparatus consists of a series of plates so disposed as to form alternate thin passages for steam and water by means of between-packings and ribs. The whole series is fixed together by bridles which pass over end bars, and is pressed up by wedges, so as to ensure steam-tight joints.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 8.—N° 1421.

HUMPHRYS, Edward.—(*Provisional protection only.*)—This invention relates to surface condensers, the object being to maintain a constant current of condensing water through suitable inlet and outlet passages, communicating between the water supply and the condenser, by the impulsive influence of a jet of steam, so directed as to impel the water in the direct course it is required to take. Or instead of a jet of steam, a jet of water is employed to attain the same end.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 10.—N° 1442.

ROBERTS, William.—This invention relates to steam boilers of the vertical class. The body of the boiler is cylindrical, and contains a numerous arrangement of vertical tubes which extend from end to end; this portion of the boiler is superposed on the furnace walls, which consist of a circular metal casing lined with fire-brick. Circumposed around the interior of the furnace is a series of vertical tubes, the upper ends of which are bent so as to communicate, at different distances from the centre, through the lower end of the boiler with the water within. The lower ends of the tubes are by means of suitable couplings fixed to a tubular ring, which is disposed round the furnace a short distance above the fire-bars; this ring tube receives the feed water which rises thence up the vertical tubes into the body of the boiler. The flaming gases and products of combustion after leaving the furnace course upwards through the tubes in the boiler into a smoke box above, wherein is an arrangement of pipes, which collect the steam from different parts of the space above the water level in the top of the boiler, and coduct it into the main steam

pipe with which the safety valve is connected. A modification exhibits the boiler furnace surrounded with water space in lieu of the brick-work lining.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 10.—Nº 1443.

ADAMS, THOMAS.—This invention relates to the construction of equilibrium slide and other valves, and to apparatus connected therewith. "A slide valve is made in two parts; one acts or "slides against the surface where the ports are made into the "steam cylinder or vessel, the other part acts against the valve "box, in which false ports are made which correspond in dimen- "sions with or are formed of larger or smaller dimensions than "the ports or passages into the cylinder, according as it is desired "to balance the pressure on both sides of the valve, or to allow "the pressure in one direction to preponderate more or less on "one side of the valve. The two parts of a valve . . . have "their inner surfaces inclining to each other, and between them "a wedge-formed piece or rectangular frame is introduced, and "these three parts are received into the ordinary rectangular "frame, and the centre or wedge-formed piece is arranged to be "set up by set screws or otherwise, so as to cause the two parts "of the valve to separate from each other, by which their wear- "ing surfaces can be set up to the interior of the valve box or "chest, and thus compensate for the wear of the surfaces. Suit- "able passages are formed in order that the pressure in the real "ports on one side of a valve may correspond with the pressure "in the false ports. . . . When using piston valves, the cylindri- "cal or other section of valve chamber has formed in it what I "have called false ports on the opposite side to where the real "ports are situated, and a passage is formed in or through the "valve or the valve seat, so that the pressure in the false ports "and in the real ports may be made to correspond."

"In working slide or piston valves when equalizing the pres- "sure on each side, a governor may with advantage be em- "ployed, and for this purpose I prefer to use an axis with a "screw or other suitable blade or blades rotating in a vessel "containing a fluid, and subject to the pressure of the fluid in a "stand pipe. This axis is arranged to act on the excentric in "such a manner as to vary its position on its shaft, or the excen- "tric may be similarly acted on by other form of governor."

[*Printed*, 1*s*. 4*d*. Drawings.]

A.D. 1863, June 11.—N° 1449.

CLARK, WILLIAM.—(*A communication from Antoine Merlanchon.*) —This invention has for its object the transformation of heat into motive power, by means of water or superheated steam. It consists in effecting the combination of oxygen with the fuel, under pressure in a closed chamber furnace without fire-bars, so as to produce the greatest amount of heat by the introduction from a receiver of a limited supply of air. The heat and burning gases generated, are brought into contact with water in an extreme state of subdivision, and the gaseous mixture resulting from the vaporization of the watery particles, and their intermixture with the burning products of combustion, is applied as a motive power to actuate a piston in a cylinder or receiver.

The generator consists of a cylindrical chamber divided by a vertical partition into two compartments which communicate at the lower part; one of these, the combustion chamber, is lined with sheet iron, and the other or generating chamber is lined with refractory bricks, as also is the sole of the furnace, which is fitted with a door capable of resisting pressure. One part of the air necessary to support combustion is introduced to the fuel at the base of the combustion chamber, and the other portion at the base of the generating chamber, so as to mingle with the burning products of combustion. A pipe leading from the upper part of the generating chamber communicates with a receiver, whereinto, through a cap at the top, the water is forced in at a great speed in a circular film, which rises against a projecting plate, whence it is thrown downwards in a finely divided state amongst the ascending burning gases. The heat vaporizes the watery particles and superheats the vapour, which is diffused amongst the gaseous products from the generator, and used to operate the piston in the high pressure cylinder, and thence conducted to act expansively on the piston in the low pressure cylinder of an engine constructed upon Woolf's system. All the details are fully described and illustrated, including a pyrometer, which is employed to indicate the temperature either in the vicinity or at a distance from the apparatus.

[Printed, 5s. 4*d*. Drawings.]

A.D. 1863, June 11.—N° 1461.

JOHNSON, JAMES.—(*Provisional protection only.*)—This invention relates to apparatus for lubricating the cylinders of steam

engines. It consists of a vessel furnished at bottom with an outlet aperture, which is closed by a spherical valve. This vessel contains the lubricant, and is fitted upon the steam pipe, communicating through the valve therewith, in order that the intermittent pressure and flow of the steam shall slightly raise the valve and cause an outflow of the lubricant. The action of the valve is regulated by the lower end of a rod, which is screwed through the cover of the vessel so as to project therein downwards towards the centre of the valve.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 11.—N° 1462.

JOHNSON, JAMES, and BRAITHWAITE, WILLIAM.—This invention relates to improvements in reversing levers for locomotive or other engines. Instead of using the ordinary segmental toothed bar and catch, a plain round segmental bar suitably mounted at each end is employed, whereon is engraved a graduated scale; this bar is bent to form the segment of a circle struck from the fixed centre on which the reversing lever moves; across the face of the lever corresponding with the radius of the bar, there is a semicircular groove in which the bar in all positions of the lever lies partly embedded. A clip, across which the other half of the groove is sunk to correspond with the groove in the lever, is jointed thereto, and by means of a triple threaded screw actuated by a lever arm and a spring, is made to clasp the bar at any point in its length. There is a short lever near to the handle of the bar, which when the two are grasped and pressed together by the hand of the attendant, by means of a connecting rod, uniting the short lever with a handle on the end of the screw, the bar is freed from the embrace of the clip. When the reversing lever is set to position, a spring attached to the handle acts upon the screw, which again clasps the bar the moment the attendant's grasp is relaxed.

[Printed, 8*d*. Drawing.]

A.D. 1863, June 12.—N° 1474.

BARRON, HENRY STRACEY.—(*Provisional protection only.*)—This invention, relating to the construction and arrangements of steam fire engines, is also in part general in its application to steam boilers and pumps. The boiler of one of these steam fire

engines is cylindrical and of the vertical class; on the top of the fire-box, which is round and low down in the boiler, a combustion chamber is rivetted, around which is circumposed a series of tubes, communicating at the lower end with the tube plate of the fire-box, and at the upper end, where the tubes diverge, with a tube plate, which extends over the whole transverse area of the boiler. The top of the combustion chamber, which rises near to the working water level, is connected by a series of short tubes with the upper tube plate. A central water tube descends from the top of the combustion chamber through the fire-box to below the furnace bars, where it unites with a number of radial tubes, which open into the water space surrounding the fire-box, whereto one or more fire-doors may be fitted. Bolted above the centre of the upper tube plate there is a steam chamber, rising some distance up the base of the chimney, which is opened out to the required size so as to form an annular smoke passage; by this arrangement the steam is superheated and dried before use. According to one modification of double acting pumps, a series of openings is made round both ends of the barrel, so as to admit of the free ingress and egress of water; two annular slide valves worked by eccentrics and suitable mechanism, cover these openings and work externally against the interior of a second barrel or casing, into which the suction or inlet pipe opens between the annular slides, beyond which, at the extreme ends, the delivery pipes are attached, and may be united to one air vessel. In another arrangement, the annular slides are dispensed with, and a cylindrical slide valve employed, the ends of which work in corresponding valve chambers close to the pump barrel. It is proposed to fit the engine with a surface condenser, and condense the exhaust and waste steam from the engine by means of the cold current of water passing through the pumps.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 12.—N° 1475. (* *)

TONE, John Furness.—(*A communication from Henry David Furness.*)—(*Provisional protection only.*)—"Improvements in the "prevention of smoke" in steam boiler and other furnaces. As applied to a locomotive boiler a small steam pipe is carried from "the boiler through the fire-box," and "one of the ordinary" flue tubes "to the front of the smoke box." It is here provided

with nozzles "through which the steam in a superheated state is "discharged into a corresponding series of tubes which pass "through the smoke box and communicate with some of the ordinary boiler tubes." As applied to a marine or to an ordinary boiler furnace, the steam is brought in a similar way "to the "mouths of one or more air tubes placed under the grate bars."

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 13.—Nº 1482.

BLACKBURN, Robert.—This invention, relating to traction engines, is supplemental to prior Letters Patent bearing date February 12, 1857, No. 414, which were granted to Isaac Blackburn, and the present inventor, who now mounts the boiler upon flanged rollers, which rest on annular rails fixed within the ends of the transverse drum cylinder, so that the boiler is placed in transverse stationary position within the drum, which is made to revolve by means of internal gearing, actuated by pinions upon the crank shaft. The ends of the flanged roller axles, rest in axle boxes attached to the side frames, and are provided with suitable bearing springs. The steering wheels and apparatus are applied to the fore part of the engine frame, whereon at each side, the engine cylinders are fixed, sufficiently apart that the ends of the connecting rods clear the ends of the drum. The boiler, which is cylindrical and of the tubular class, contains two furnaces which are fixed at the side; the frame extends to the rear of the drum.

[Printed, 8*d*. Drawing.]

A.D. 1863, June 13.—Nº 1488. (* *)

WAGSTAFF, Henry Graham William.—"Improved apparatus for feeding steam boilers with water, which apparatus is "also applicable for raising water."

This apparatus consists of a close vessel or cistern communicating with a boiler by two pipes, one entering at the upper part through which steam passes, the other connected with the bottom through which water passes to the boiler. The cistern is kept supplied with water. In the boiler is a float which falls as the water evaporates, and thereby opens a cock in the steam pipe connected with the cistern. The pressure of the steam forces the water through the lower pipe or syphon from the cistern into the

boiler. When the requisite quantity has entered, the float ascending shuts off the steam, and thus stops the supply of water. When used for raising water the action is similar, excepting that the water to be raised passes upwards through the lower pipe or syphon, and not into the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 13.—N° 1490.

SHAND, James.—This invention relates to steam fire engines and steam boilers for the same and other purposes. The first part consists in employing a vertical double-action inverted steam cylinder, concentrically superposed above a water cylinder fitted with bucket and plunger which is connected to the steam piston by two rods; a crank shaft whereon are mounted a fly wheel and the excentrics for working the slides and feed pump, is disposed in suitable bearings fixed upon the cylinder, which is furnished with suction and stop valves in connection with air vessels, and delivery valves and outlets to which the hose is attached. A self-acting governor is provided which is operated by variations in the water pressure. The framing is formed by two longitudinal metal tubes and cross stays to which the boiler and hind springs are attached, as also a box for containing the necessary tools and appliances, the foot platform, and a receptacle for the stowage of hose in coils or otherwise. The boiler is placed in front of the hind axle, and the steam and fire apparatus at the back. 2. Relates to the boiler which is of the upright cylindrical class, containing vertical tubes and a smoke chamber, and also two detached semi-circular chambers, which by means of tubes communicate with the steam space, and fill the space between the tubes and the outer shell; these chambers are designed to increase steam space and reduce the quantity of water, in order that steam may be more rapidly raised. The upper part of the boiler is attached to the lower part by means of bolts and nuts for the convenience of removal when either cleaning out or repairs are necessary.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, June 15.—N° 1491.

BOX, Willam Williams.—(*Provisional protection only.*)—This invention relates to the construction of fire-bars for the

boiler furnaces of locomotive and other engines, and for fire-boxes and furnaces generally. The fire-bars, of any required form or section, are made hollow or tubular, and screw threaded at each end. The ends are screwed respectively into return tubular unions, so disposed, that when the bars are arranged in proper order side by side, a continous open passage leads through each bar in succession, extending from one end of the first bar, to the end of the last bar of the range. A feed water cistern is so placed in communication with the range of tubular bars, that the water becomes heated by circulating through them, and if necessary both ends of the range may be put into communication with the water in the boiler, and thereby assist in generating steam. By means of suitable contrivances an upward and downward motion is imparted to the fire-grate.

For the fire-boxes of locomotives, it is proposed to mount the fire-bar range about its midlength upon pivots, so that by means of a link or other piece of mechanism, according to the direction in which the engine is travelling, an increased draught of air may be obtained by depressing the corresponding end of the grate.

[Printed, 6*d*. Drawing.]

A.D. 1863, June 15.—N° 1499.

CLARK, William.—(*A communication from John Benjamin Root.*)—This invention, relating to engines for obtaining motive power from steam or other fluid, is partly applicable to pumps. Its chief feature "consists in the combination of two pistons, one "of which is hollow, and fitted within a parallel sided box, which "may be termed the 'cylinder' of the engine, in such manner as "to be capable of a reciprocating rectilinear motion therein, and "the other is fitted to the interior of the first one in such "manner as to be capable of a reciprocating rectilinear motion "therein in a direction at right angles to the first-mentioned "reciprocating rectilinear motion, and the inner one is connected "directly with a crank. In an engine to be used as a motor, the "steam or other fluid from which the power is obtained is admitted "by a suitable valve or valves to the outer box or cylinder and to "the interior of the outer piston in such manner as to act first on "one and afterwards on the opposite side of each piston, and to "commence operating on either side of one piston when the other "piston is at half-stroke, so that it acts upon both pistons at "once to produce a rotary motion of the crank, which is thereby

" made to transmit the power without ever being at a dead point.
" In a pump the motion of the crank, produced by a suitable
" application of power to its shaft, sets the two pistons in motion
" at right angles to each other, and the water or other liquid is
" thereby drawn into and expelled from the cylinder and outer
" piston through a suitable valve or series of valves."

The other parts of the invention relate to the employment for the induction and eduction of steam to and from an engine or pump fitted with such a system of pistons, of a suitable disc valve, which is applicable to engines otherwise constructed.

Reversing the direction of the motion of the engine by means of the excentric, which being loosely fitted on the shaft, is caused to make, by the aid of suitable appliances, a movement in the direction of rotation, so as to shift the steam valve to a reverse position in relation to the crank.

Lubricating, by means of the steam pressure acting in a closed oil vessel upon the lubricant, the crank wrists and bearings, which being within the inner piston cannot be reached by ordinary means.

[Printed, 1*s.* Drawing.]

A.D. 1863, June 16.—N° 1501. (* *)

SHEDLOCK, James John.—" Improvements in valves for the
" passage of steam, gas, and fluids."

The improved valves have a case or body in which are inlet and outlet passages. " In the interior of the case or body ledges or
" guides are fixed for the purpose of carrying a plate or carriage,
" upon one end of which is fixed the valve. A pin or projection
" is securely fixed in the plate or carriage at a distance from the
" valve corresponding with a spiral." The spiral is fixed on a spindle, which, passing through a stuffing box, is attached to a wheel or lever. Upon turning this wheel or lever in the required direction, the spindle and spiral are made to describe a circle; part of the spiral pressing against the back of the valve forces it forward until the greatest radius on the spiral presses against the valve, whereupon the valve is forced upon its seat and the passage of fluid cut off.

[Printed, 10*d.* Drawing.]

A.D. 1863, June 16.—N° 1510.

NEILL, William, junr.—This invention relates to steam engines, particularly applicable for pumping and forcing water, and also

other purposes. It consists in operating the steam and main piston by mean of a small supplementary cylinder and piston valve, actuated by the direct action of the exhaust steam, without the intervention of the usual mechanical appliances, the small piston and cylinder being substituted for the ordinary slide valve and steam box. The details are varied and modified. Within a cylinder of considerable length, the main piston occupies about one half of the internal space; two exhaust passages open into the cylinder about its mid-length and communicate with the ends respectively of the small valve cylinder. When the main piston has nearly completed its stroke in one direction, it uncovers one of the exhaust passages, and admits the exhaust steam to the corresponding end of the valve cylinder which shifts the valve piston, thereby closing one inlet port and opening the other for the return stroke of the main piston, near the termination of which, the other exhaust passage is uncovered, wherethrough the exhaust steam escapes into the opposite end of the valve cylinder thereby effecting the return motion of the valve piston, which during these movements is brought into coincidence with the steam admission passages, the inlet ports and the final exhaust. The modification exhibits a cylinder and piston of the ordinary proportions; the valve piston is actuated by its rod which receives motion mechanically from the main piston rod to which it is attached by suitable connections; this valve piston is designed to cut off the steam at any part of the stroke by means of adjustable stops mounted on the valve piston rod.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, June 17.—N° 1517. (* *)

SPENCER, John Frederick.—(*Provisional protection only.*)—
" Improvements in steam, gas & water tube joints."

In place of the usual joints, metal ferrules are substituted for them, according to this invention. " The tube plate has holes, " drilled or otherwise formed true, of a diameter larger than the " external diameter of the tubes, so as to admit of a ferule being " inserted, and such holes may either be parallel or be slightly " taper or conical. Each end of each tube being first made " cylindrically true and smooth, and the tube being sufficiently " long to project through each tube plate to some extent, and the " iron, steel, or other metal ferule . . is forced over or driven on " to the end of the tube, and into the annular space left between

"the external diameter of the tube and the interior surface of the "hole in the tube plate. The ferules . . . are formed with a "shoulder or bead at one end of a sufficiently increased diameter "to enable the ferule to be withdrawn from off the end of the "tube, and out of the hole in the tube plate by means of a "fork-like instrument or suitable lever tool employed for that "purpose."

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 19.—N° 1538.

MOREL, Augustin.—This invention relates to traction engines, for use on common roads and agricultural purposes. The steam is generated by the combustion of inflammable oils. The engine is mounted on two hind wheels, free to turn in either direction upon an ordinary axle, which passes through an opening between the sections of the boiler, and upon two fore wheels which answer the two-fold purpose of driving and steering wheels. The boiler is supported by two laminated side springs which bear upon the after axle; it consists of two horizontal cylindrical chambers, disposed one over the other and united by short vertical tubular connections; the upper part of the chimney casing constitutes the steam chamber above the water level, which rises and is established therein above the top of the boiler. The fire-place is at the after end, within the lowest section of the boiler; it contains hollow metal blades or burners, placed one against another in connection with a feeding tube, through which the inflammable fluid is supplied to asbestos wicks and burners, in regulated quantities by means of a float; arrangements are provided for the admission of the requisite quantity of air to support the inflammation of the evolved gases, which in a flaming state course through a central longitudinal flue tube to the fore end, and there pass up a short vertical passage into the upper section of the boiler, which contains two longitudinal flue tubes, wherethrough the hot draughts go and return to the chimney tube above, which passes up through the surrounding water at its base and through the steam chamber above. The cylinders are horizontally disposed at the sides of the boiler, and by their respective pistons and connecting rods, give motion to a transvere crank shaft, the ends of which are supported by stay rods. The tank, which is at the fore part of the engine, is closed and the water contained is forced into the boiler by pumping air into the tank. The brakes are worked by the air

compressed in the tank, and motion is communicated to the fore axle by pulleys and straps. A variety of devices and contrivances are adopted for placing every necessary movement of the engine under the control of the driver, who is seated in front and taught to consider himself driving a blind or "automaton horse," the name by which the engine is designated.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 22.—N° 1568.

ROWAN, WILLIAM.—This invention relates to the metallic packings of pistons, and consists, "in keeping steam-tight the "surfaces of the top and bottom of the packing ring between the "junk ring and lower part of the piston, as well as the sides "against the cylinder, by means of an expansion ring," "cut into "four, six, or eight segments according to the size of the piston, "and placed behind the packing rings (of which there are two); "the expansion ring is angled on the outside edges top and "bottom, and is fitted against corresponding angles on the inter-"nal side of packing rings, the segments of the expansion ring "being acted upon by springs of the usual description at the "back are pressed against the packing rings, which, being sepa-"rate, are, by virtue of the angles, pressed against the cylinder, "the bottom surface of the junk ring, and the upper surface of "lower edge of piston as above mentioned, thus rendering the "whole steam-tight." In a modification, the springs at the back of the expansion ring are dispensed with, and the ring retained in one piece to act as a spring ring, instead of being cut into segmental sections; the outer edges of this spring ring are bevelled top and bottom, to press against corresponding bevelled surfaces shaped at the back of the packing rings.

[Printed, 8*d*. Drawing.]

A.D. 1863, June 22.—N° 1572.

WINANS, WILLIAM LOUIS, and WINANS, THOMAS.—This invention relates to marine steam engines, the cylinders of which are disposed below the propeller shaft, which rests in bearings fixed on the cylinder covers. An engine with a pair of cylinders is illustrated and described, but a greater or lesser number of cylinders may be arranged to act conjointly upon one propeller crank shaft. The cylinders stand in a line below the shaft which

rests in suitable bearings fixed on their covers; to each cylinder there are two piston rods, which work out through stuffing boxes disposed on opposite sides of the centre of the cylinder covers, so as to work clear of the crank shaft. The outer ends of the piston rods are attached to the sides of a crosshead, the extremities of which carry the connecting rods; the lower ends of these rods are coupled to the cranks which partly revolve down by the sides of the cylinder. By this arrangement a long stroke is obtained for the pistons within a comparatively small space, and the general construction of such engines is simple. Suitable fixed vertical guides are provided to steady the crosshead, and the crank shaft is composed of separate lengths, coupled between the cylinders outside the crank arms; preference being given to a coupling for which these inventors obtained Letters Patent bearing date 20th June 1863, No. 1556.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, June 23.—N° 1583.

WINANS, William Louis, and WINANS, Thomas.—(*Provisional protection only.*)—This invention, relating to "lessening "the friction of the rubbing surfaces of the slide valves of engines "and of the journals of shafts," is effected by sinking a recess into any convenient part of the rubbing surface of the valve or shaft, and admitting into such recess, under pressure, steam, air or other fluid or liquid, between the valve and valve face. By properly regulating this pressure it will counteract against the external pressure on the valve, and consequently, the friction on the surfaces will be lessened, care being taken that the superponderance be on the back of the valve, otherwise the valve would be raised from its seat. To relieve the friction on machine and other shafts, recesses are made in their under bearings, and a pressure regulated according to the weight of the shaft, is applied in the recess by means of steam, compressed air or water, so as to sustain a portion of the friction between the shaft and bearings, whether arising from weight or otherwise. The removal of the recessed part of the bearing surface, should be compensated by making the surfaces proportionately wider. Auxiliary bearings in addition to the ordinary bearings are sometimes employed, to which stuffing boxes to prevent the escape of the compressed fluid may be adapted.

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 23.—Nº 1584.

WINANS, William Louis, and WINANS, Thomas.—This is an invention of apparatus for superheating steam in steam boilers. It is illustrated and described as applied to a vertical boiler which the inventors state "is one that we have invented "and for which we have obtained Letters Patent." The upper part of such boiler is shown to contain vertical fire tubes grouped round a central space which is left clear for the purposes of examination and the better circulation of the water contained; a steam dome surrounded by an annular flue space, is superposed above the central space, and the superheating apparatus, which consists of an arrangement of circular tubes enclosed within the boiler case, surrounds the flue space. Suitable dampers and valves are conveniently arranged for directing the heated gases and products of combustion after their upward course, through the vertical tubes either wholly or partially direct to the chimney, through the annular flue surrounding the steam dome, or amongst the circular tubes of the superheating apparatus, which communicates with the steam dome, and through which the steam is made to circulate.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 23.—Nº 1586.

MEIN, Andrew.—(*Provisional protection only.*)—This invention relates to apparatus for generating steam. "A furnace or fire-"place is constructed, from the upper part of which a flue "proceeds to a chimney or stack, the flue being by preference "horizontal or nearly so, till it arrives at a point where a "cylindrical or other suitably formed vessel is set, under which "the back end of the flue passes, and it is preferred that the flue "should then descend a distance and then pass to the stack or "chimney. The cylindrical or other vessel passes across the flue, "and a series of parallel tubes, inclining downwards, are fixed at "their upper ends to the vessel, and pass along the horizontal "flue and over the fire in the furnace; they then pass through "the front brickwork, where each of them has a screw cap or "plug affixed at its end, in order that the interior of each tube "may be readily got at and cleaned, or the ends of the tubes "may be connected together in such manner that they commu-"nicate the one with the other. The parallel inclined tubes do

" not touch each other, but spaces are left between them, so that " the heat and products of combustion rising from the fire and " passing through the horizontal flue may pass freely between " the neighbouring tubes. Water is kept supplied to the vessel " so as partially to fill it; the upper ends of the tubes are also " only partially filled with water, as the tubes are inclined, and " their upper ends where they open into the vessel are partly " above the water line. Spaces are thus left above the water in " the upper parts of the tubes to facilitate the steam getting from " the lower as well as from the upper parts of the tubes into the " upper part of the vessel, at the same time a constant supply of " water from the vessel to the tubes is insured."

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 25.—N° 1597. (* *)

RIPLEY, Abraham.—" Improvements in the method and con-" struction of a packing chiefly applicable to piston rods, pumps, " and such like, and for forming the joints of gas, steam, or water " pipes."

This packing consists of a cord, whereof " the interior is formed " of porous fibrous substances, which are saturated with oil, tallow, " or other suitable lubricant, whilst the exterior of the cord is " covered by a weaving composed wholly or partly of wire. The " packing cord when used for packing a piston rod . . . is either " wound round the piston rod spirally in a suitable stuffing box " or chamber, or a series of lengths are passed once round the " piston rod, so that the two ends of each length meet, and the " successive lengths are arranged in such manner that the ends " of one length of the cord do not come opposite the ends of the " next or neighbouring lengths, but break joint therewith. The " packing of a piston rod . . . having been arranged as above " explained, the packing is to be compressed by a gland or " other suitable instrument to retain the packing under " pressure."

[Printed, 4*d*. No Drawings.]

A.D. 1863, June 27.—N° 1614.

DUNN, Thomas.—This invention relates to manifold plans, divers kinds of apparatus, and facile means for constructing the permanent way of railways, with a view to their maintenance and

stability. A great variety of designs for chairs and sleepers are exhibited and described. Some of the chairs are made in two parts, so as to embrace sleepers variously shaped, the lower part being formed with spreading corrugated or undulating surfaces and fan like plates, for the purpose of sustaining weight and preventing lateral displacement. The mode of fastening by bolts and trenails combined and otherwise, forms part of the invention.

To facilitate operations in the construction and maintenance of permanent ways, the inventor provides a portable workshop or combined apparatus called the "plate layers steam companion;" this comprises a small locomotive engine, and a crane and machinery consisting of various tools for sawing, drilling, punching, bending, and pressing the wood and metal required for the construction and maintenance of the way, and these are all supported and arranged upon the platform of one truck or carriage.

"The engines and boiler are connected to a frame swivelling on "the pillar of the crane, the jib of which can be raised or lowered "by links. The frame to which the engines and boiler are con-"nected, and the framing of the truck or carriage form tanks to "contain a supply of water for the boiler. The crank shaft of "the engine, by means of suitable gearing, works the chain "barrel of the crane, and moves the crane round its central "column; it also gives motion to a second shaft, which by suitable "gearing propels the whole apparatus along the rails, and drives "by straps the various machines" and working tools. "A "smith's forge is also mounted on the truck or carriage to repair "the various tools employed."

[Printed, 7*s*. Drawings.]

A.D. 1863, June 29.—N° 1621.

AVERY, Cyrus.—This is an invention of a rotary engine, which consists of the circuit of a round piston within a hollow ring or piston way, which is formed concentric with the axis, by sinking an annular semicircular recess in the face of each half of the cast metal case; also in each half of the case surrounding the piston way, a shallow flat recess is formed to receive a flat circular ring plate of hardened steel, to which the piston is attached, and which revolves therewith. In an annular space formed between the circular piston way and the axis, there is an arrangement of cams and a fixed roller, which as the piston and plate revolve,

project two or more valve plates in succession across the piston way, and thus form resisting surfaces for the steam, which enters the piston way through the plate and piston back; the necessary exhaust passages are provided, and the plate partly cut away to allow for the escape of the steam. The case is bolted down to a foundation plate, and carries one end of the revolving axis or shaft in a bearing at each side; a cast metal standard carries the other end of the shaft, upon which interposed between the engine case and the standard, there is a fixed pulley for giving off motion by means of a strap or otherwise.

[Printed, 10*d.* Drawing.]

A.D. 1863, July 1.—N° 1633.

BLAKE, JOHN.—This invention relates to apparatus for reducing and regulating the pressure or quantity of steam supplied to cylinders, pipes, and vessels, and for discharging the water of condensed steam therefrom. It consists (1,) of a closed steam chest containing a double mushroom or equilibrium valve which opens inwards and admits steam from the boiler: the bottom of the valve spindle is furnished with a balance weight, and its upper end is connected to the short end of a horizontal lever, which supports at its other extremity a small vessel about three parts filled with mercury; a tube which is fixed to the bottom of another small vessel superposed in a fixed position over the chest, descends through its cover and dips deep into the mercury. The height of the upper vessel, which is open at the top through a tube to the atmosphere, determines the reduced pressure at which the steam is to be maintained, the balance on the lever being regulated between the weight and the vessel by the pressure of steam on the mercury contained in the latter; when the pressure is in excess the mercury is forced upwards into the upper vessel, which reduces the weight of the mercury vessel, and allows the valve weight at the other end of the lever to, more or less, close the valve. Modifications of this part of the invention are described. 2. Instead of forming a steam trap with one chamber to receive different pressures of steam, the trap is partitioned into a sufficient number of separate chambers to correspond by means of separate inlet pipes with all the pressures; each compartment is furnished with a float which operates a separate valve governing an outlet pipe from each: by this

arrangement the water of condensation from various pressures is discharged into a common receiver by one compound steam trap.

[Printed, 8*d*. Drawing.]

A.D. 1863, July 4.—N° 1662.

EYTH, MICHEL EMILE.—This invention relates to rotary steam engines. It "is composed of a circular hollow ring or steam "channel, the section thereof being of a circular shape, it could, "however, be of any other regular shape. A piston made as "usual of one or two springy metallic rings is fitted and plays in "the circular steam channel, where it is pushed forward by the "steam introduced once at each revolution at a proper time. "The main shaft is placed at the central part of the ring-shaped "steam channel; it is provided with a rather thin crank or "forked cam, which enters and runs freely in a groove cut all "round the inner part of the steam channel where it is caught "and actuated by the back part of the piston which thus causes "the shaft to rotate. To prevent the steam introduced into the "channel escaping through the inner circular groove a tight "joint is made by means of an endless chain composed of com-"pact links fitted exactly in the groove; this chain is raised up "by the forked end of the cam or crank as it passes, and directly "after the said chain is pressed back down to its place in the "groove by the piston as it runs in the channel, thus there can "be no escape of steam. A moveable partition in the steam "channel is raised up by the piston as it runs, and the steam "escapes at these times through an outlet suitably placed. After "the passage of the piston the partition falls back, and the "steam entering betwixt the said partition and piston pushes the "latter forward. The same motions take place for each revolu-"tion of the piston and shaft."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, July 4.—N° 1666.

BONNEVILLE, HENRI ADRIEN. — (*A communication from Auguste Ghilain and Edouard Poncelet.*)—(*Letters Patent void for want of final specification.*)—This invention relates to a mode of obtaining direct rotative motive power, by the aid of steam subordi-*nately* applied. The ordinary cylinder, connecting rod, and crank

shaft are dispensed with, and the fly wheel alone mounted on a horizontal main shaft, is made to subserve the purposes of the engine. The spokes or arms of the wheel are hollow, and each contains a piston; each piston is diametrally connected with the piston in the arm on the opposite side of the axis of the wheel. The action of the valves is so timed that as the wheel revolves and each arm in succession is about to arrive at a vertical position over the axis, the piston contained therein is divergently forced upwards towards the periphery of the wheel, at the same time that the piston to which it is connected in the arm below the axis, is convergently raised towards the centre, in which position both remain for half a revolution, which brings the latter piston into vertical position above the axis, to be operated in turn by the steam and forced up to the periphery, whilst the other piston which is then below the axis is lifted simultaneously towards the centre. In this manner the axis of the wheel becomes the common fulcrum to each pair of pistons, and the wheel is set in motion not by the power of the steam direct, but by the superior leverage and consequent weight respectively, in relation to the fixed centre or fulcrum, of the pistons above the axis as they come up and are raised in succession and held by the steam to the periphery of the wheel or outer end of their stroke, while on the descending side of the wheel, as compared with the weight and leverage of the pistons on the ascending side, which are then drawn up towards the axis or fulcrum.

[Printed, 6*d*. Drawing.]

A.D. 1863, July 7.—Nº 1681.

SCHIELE, Christian.—This invention relates to turbines, which under certain modifications may be driven by either water or steam. Three modifications of water turbines and one steam turbine, are described and illustrated, showing the manner in which the fluid is caused to enter the fluid passages, and the mode whereby their areas are regulated in relation to the supply of the fluid, and to the power required to be given off; the object being (amongst other advantages sought) simplicity of construction, and economy of manufacture.

Describes particular modes whereby the water or fluid is more efficiently guided into the fluid ways and passages in the turbine wheel, without any shock or jerking interruption to its even flow,

so that the effect on the turbine is constant, and in consequence the power given off greatly increased.

Describes arrangements for effecting the simultaneous regulation or adjustment of the area of the fluid ways in the turbine, and of the passages in the inlet guides, so that the altered area of the passages in the inlet guides, corresponds in proportionate relation to the altered passages or fluid ways in the turbine wheel, whereby the power of the turbine may be diminished as required, without lessening the efficiency of the inlet guides, loss of water or fluid, or prejudicially interfering with the effect.

Also describes modes of regulating or governing turbines, to suit the economical consumption of water passing in variable quantity and with variable pressure.

For governing turbines worked by steam, slides are employed, which by means of screws, close a greater or lesser number of the fluid guides.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, July 9.—N° 1711.

DELANY, Joseph Francis, and OKES, John Charles Raymond.—(*Provisional protection only.*)—This invention relates to the pistons of steam engines, which are intended to operate without the usual metallic or other packings. The piston is fitted to slide easily within the cylinder; around its periphery, in place of the ordinary recess being sunk to receive the packing rings, numerous indentations or grooves are made, round the circumferential surface of the piston, side by side, which form a series of annular flutes: in the course of working, the water of condensation accumulates within and fills these flutes, whereby the passage of the steam between the piston and the cylinder is prevented, whilst the water serves and acts as a constant lubricant. The periphery of the piston should be sufficiently broad to contain a good number of the annular grooves: the body of the piston may be hollow or otherwise, and made conveniently light consistent with the necessary amount of strength required.

[Printed, 4*d.* No Drawings.]

A.D. 1863, July 10.—N° 1726.

HORNSBY, Richard, junior, BONNALL, John, and ASTBURY, William.—This invention, relating to traction engines

and apparatus for ploughing and tilling land by motive power, is also applicable to driving or giving motion to machinery. In traction engines for hauling agricultural implements, a horizontal tubular boiler is (by preference) employed. The cylinders, fitted with trunk pistons, are disposed low down in or near the smoke box, or underneath the boiler. The crank shaft, to which the connecting rods are coupled, is transversely disposed under the boiler; it carries a fly wheel, and also a pinion which gears into a spur wheel on a counter shaft also under the boiler. This latter shaft carries a chain pinion which, by means of a pitch chain, gives motion to a chain wheel upon the axle of the hind driving wheels, and so causes locomotion. The weight of the engine is carried by rods connected respectively at their upper ends with the bearings of the axle, and at their lower ends with (by preference) helical springs which accommodate themselves to the varying position of the axle, and rest on brackets fixed to the boiler and framing. For hauling agricultural implements, winding drums are mounted on a horizontal shaft, longitudinally disposed under the boiler between the fire-box and the counter-shaft, whereon is a bevelled pinion which is brought into activity by a clutch, and drives a bevel wheel upon the drum shaft with which it is in gear. The drums are made to revolve respectively by means of a clutch, operated on the shaft between them by a forked lever, otherwise they are loose upon the shaft, and can thus be brought into operation at any time without stopping the engine. The driving chain is composed of link pieces of three different forms, consisting of circular ring links bored true, segment pieces, and connecting links. In the construction of steam ploughs, a frame is employed mounted on two front or steering wheels, and one wheel behind placed on the land side of the implement. The frame carries any convenient number of ploughs arranged in the usual diagonal position aslant the frame, which is provided with a forked standard for each plough. The body and beam of each plough are of wrought iron, and made to receive the share, mould board, and coulter; by turning a handle on the axis of a pinion, a toothed sector is brought into activity, whereby the ploughs can all simultaneously be raised out of, or lowered into the land. In some cases double implements are constructed, which consist in placing two sets of ploughs, each set facing in opposite directions, on each side of the steering wheels, which are then disposed at the mid-length of a lengthened frame. Each set

of ploughs may be raised or lowered separately, or the gear may be arranged so as simultaneously to raise one set while lowering the other. Scarifying implements may be similarly constructed. The invention also extends to harrows for pulverizing the land after it has been broken up by the ploughs; these harrows ordinarily consist of a series of frames united by short chains, and carrying a number of spikes projecting downward from their under sides. In order to prevent the wearing away of these spikes, each one is protected by a sheath of chilled cast metal; to suit different operations, the sheaths may be shaped accordingly, and when required, readily changed for the purpose.

[Printed, 4*s*. 4*d*. Drawings.]

A.D. 1863, July 14.—N° 1759.

SAXON, GEORGE.—(*Provisional protection only.*)—This invention, relating to metallic pistons, is applicable to the cylinders of those engines which are not disposed in a vertical position, and consists in causing both the rings and springs to be free to shift round in whatever position in relation to the internal circumference of the cylinder they may respectively be placed, so that the force of gravity shall not effect them. This is accomplished "by form-
" ing the annular eccentric or taper spring or springs which press
" the outer ring or rings to the cylinder with additional material
" or projcetions placed in such situation and quantity so that each
" of the said springs shall be evenly balanced, and thus be enabled
" to rotate round the central axis of the cylinder. The said addi-
" tional material or projections may be placed on either the inner
" or outer surface or both surfaces of the spring or springs, whilst
" the strength of the spring is still reduced from the back or heel
" towards the point so as to produce a uniform pressure on the
" outer rings and the circumference of the cylinder when they
" are placed in an angular or horizontal position."

[Printed, 4*d*. No Drawings.]

A.D. 1863, July 14.—N° 1760.

DAVISON, JAMES.—The main object of this invention which relates to steam boiler, smelting, and other furnaces, is to preserve the fire-bars and the other parts which are exposed to the greatest heat, from its injurious and destructive effects. This is accomplished by forming open channels through the fire-bars and adja-

cent parts, and sending therethrough a current of water which carries off the heat, and avoids the necessity, in the case of smelting and glass furnaces, for the use of limestone "scauls" or other intermediate protecting substances on the grate bars and exposed parts of the furnace. The water heated by its passage through the fire-bars and parts adjacent, is (when the invention is applied to steam boilers) used as feed water, the feed pipe being attached either to the bars separately or in pairs, or by means of a transverse chamber, through which the water passes from the source of supply. The water in a steam boiler by suitable arrangements of pipes, is made to circulate through the furnace bars and return to the boiler, thereby preventing the burning of the bars, and utilizing the heat by the generation of steam.

[Printed, 8*d*. Drawing.]

A.D. 1863, July 18.—N° 1804.

PAGE, William Charles.—(*Provisional protection only.*)— This invention relates to the mixture of certain liquid and soluble matters, for the purpose of forming a compound solution, to be used in steam boilers in regulated quantities, for removing and preventing incrustation therein. The solution is prepared by heating together in an iron pot, creosote (oil of tar) or other vegetable, animal, or mineral oil, with chloride of ammonium, carbonate of soda, caustic soda, or potash, or other soluble chloride or carbonate, in the proportion of sixteen parts by weight of creosote, to one part by weight of either of the alkalies named. The solution is introduced into the boiler through the feed pipe, in quantity at the rate of one pint for each nominal horse power of the capacity of the boiler, which will be found sufficient to last about eight weeks; at the expiration of that time the boiler should be blown-off, the sediment cleared out, and the same proportionate quantity of the solution added to the fresh water. Boilers previously incrusted should be blown off and the solution introduced every two or three weeks until the incrustation is softened, in which state it can easily be removed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, July 18.—N° 1806.

MURDOCH, George.—This invention relating to the construction of steam and vacuum gauges, consists in forming a chamber,

by placing face to face, two concave surfaces, flanged round for the purpose of fixing between them a flexible diaphragm, whereby the chamber is divided, one side of which communicates with the lower end of a vertical glass tube, wherein, descending from the upper end of the tube where it is fixed, is a metal spindle or rod which gradually tapers downward to a point within a short distance of the bottom of the tube, whereby the upward internal capacity of the tube is gradually and regularly diminished from the lower to the upper end, for the purpose of compensating for the unequal displacement, (by the diaphram in relation to the increasing pressure,) of the mercury which is contained in this division of the chamber and which rises in a normal state up the tube to the point of the rod. The tube is enclosed in a thin metal case open in front, through which the tube and level of the mercury can be seen, and the pressure, or the vacuum is indicated on a graduated scale marked on each side of the opening in the case. The other half of the chamber is filled with oil or distilled water and is capable of being placed in communication with the steam or other pressure, the force of which upon the surface of the oil or water, which is always maintained at a uniform level by means of a suitably formed pipe, presses the diaphragm upon the mercury and so causes it to rise. When used as a vacuum gauge, the half of the chamber containing the oil or water, is by means of suitable cocks opened to the atmosphere, and the mercurial division by a suitable cock is placed in communication with the vacuum.

[Printed, 8*d*. Drawing.]

A.D. 1863, July 20.—N° 1812.

BAILEY, John, and BAILEY, William Henry.—This invention which relates to means for the prevention of steam boiler explosions, consists of the peculiar construction of a plug containing a small fusible plate. This plug is inserted through the end or other part of the boiler, at a point so much below the ordinary working water level, that if the water sinks beneath the plug, the heat of the steam shall so soften or melt the metallic alloy of which the fusible part of the plug is composed, as to render it incapable of withstanding the pressure of the steam, and so cause it to give way, thereby providing a means of relief to the boiler. The plug case is a short hollow tube of brass or other metal, upon the top of which the small fusible plate is

secured steam-tight by means of a recessed annular nut: a small piece of copper is cast in the centre of the plate, which by its heat-conducting quality causes the fusible metal when exposed to the heat of the steam more readily to soften or fuse, and give way.

[Printed, 8*d*. Drawing.]

A.D. 1863, July 21.—N° 1829.

ALCAN, GOUDCHAUX, administrator of EMILE ALCAN.—(*A communication from Leon Gauchez.*)—The invention relates to apparatus for condensing and preventing the escape of steam along with the water of condensation. A cylindrical or other shaped vessel is suspended from the short arm of a lever, the long arm of which carries a balance weight, which is in equilibrio with the vessel when the latter is about one-fourth filled with water; the bottom of the vessel is furnished with a valve, which communicates with the outlet pipe and closes downwards with its own weight, the stem of the valve projecting below the bottom of the vessel. The steam enters the vessel through a pipe near the top where there is an air cock. The lower valve is always covered with water, which as condensation goes on, gradually rises until it attains an upper level in the vessel, which then becoming superponderant to the balance weight, descends and brings the valve stem of the lower valve in contact with the base plate of the apparatus; this causes the valve to rise, and an outflow takes place and continues until the balance between the weight and the vessel is restored, and the latter is again raised to its normal level to await the succeeding accumulation of water, when the operation is repeated, and continues to go on in intermittent outflows.

[Printed, 6*d*. Drawing.]

A.D. 1863, July 21.—N° 1830.

NAYLOR, WILLIAM.—This invention relates to the construction of safety valves, and consists (in cases where a spring is employed to resist the opening of the valve) in the employment of a lever of the first order, one end of which presses upon the point of the valve spindle, and the other end upon a helical spring, both points of pressure being about equidistant from the fulcrum. When the valve is closed, the apex of the spindle is about level with the fulcrum, but the end of the lever which operates on

the spring is turned down, so that the point of resistance is brought to an angle of about 45° in relation to the plane of the fulcrum. When the valve is raised by the steam pressure and the spring depressed, the perpendicular action of the latter by reason of its position is much less than the valve, and this action diminishes as by the further opening of the valve, the point of pressure upon the spring by the other end of the lever is brought more directly under the fulcrum, thereby increasing the leverage power of the valve in proportion to the increasing compression of the spring. In some cases it is intended to place the spring in tension, and cause it to act at right angles to the valve: also "to employ a cylinder with a piston acting against a spring, "resisted by the end a lever projecting over from the valve, the "compression of this spring will indicate the pressure of the "steam in the boiler, and when the maximum pressure is attained "it will assist in lifting the valve."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, July 23.—N° 1842.

FILLION, Louis Laurent Jacques.—This invention relates to a mode of extinguishing fires in flues and chimneys, and preventing steam boiler explosions. It consists in maintaining the open position of chimney dampers, by means of a weight superior to the weight of the damper, such weight being suspended either by a wire composed of such a metallic alloy as will melt at a low temperature, or by a string or rope made of vegetable or other combustible substance. When a fire takes places in the chimney, the weight falls so soon as the wire melts or the string burns, the damper immediately closes, and by stopping the air draught which supports combustion, causes the fire at once to languish and die out. The same device is applied to the safety valves of boilers; the metallic or other wire being composed of such an alloy as will melt when the temperature of the steam is raised above the fixed pressure, and thereby disengage the weight and allow the safety valve to fly open. Various plans of dampers are illustrated and described.

[Printed, 6*d.* Drawing.]

A.D. 1863, July 27.—N° 1868.

WHITTAKER, James.—This invention relates to steam engine cylinders, wherein, connected to two piston rods which work

respectively out at the opposite ends of the cylinder, four reciprocating pistons are arranged to operate. The cylinder is furnished with five steam inlet ports. Two illustrations are shown and described. The first consists of a cylinder composed of short lengths which when united form a cylinder sufficiently large to contain four pistons, say for distinction Nos. 1, 2, 3, and 4, and also longitudinal space for action. Pistons 1 and 3 are mounted, a suitable distance apart, upon one piston rod, and piston 4, is disposed in the usual manner upon the piston rod which works out of the cylinder at the opposite end, piston 2, being united to piston 4, by two subordinate rods which work through stuffing boxes disposed outside the high-pressure section No. 3 of the cylinder; this section is of much smaller diameter than the others, and into it the steam at high pressure is first admitted, and alternately operates between the small piston 3, and pistons 4, and 2 in succession, whence it exhausts into the other section and thence, having reached its terminal force, is discharged into the condenser. The second illustration exhibits a cylinder containing four pistons of equal diameter, united and operated by high and low-pressure steam in the same manner, the subordinate piston rods which unite pistons 2, and 4, passing through stuffing boxes in the intermediate piston 3. This cylinder is made in one casting, and like the other is furnished with five steam inlet ports, and three steam boxes containing two single and one duplex slide valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, July 28.—N° 1874.

JEWELL, John.—This invention relates to the setting of boilers which (in order to obtain better results as regards the consumption of fuel, and at the same time avoid bringing the brickwork and lime in contact with the boiler) are (below the water line) covered with an outer casing constructed of metal plates with intervening longitudinal partitions, which form intermediate flue spaces along each side of the boiler. Exterior to such flues, water tanks are formed, wherein the feed water is received and heated previous to its admission into the boiler. Cylindrical boilers, with internal furnaces, should be constructed with three longitudinal external side flues below the water line. There should also be a central bottom flue. The heated and flaming products of combustion

from the furnace, having passed through the internal boiler flue, should be caused to divide and pass along the upper flues respectively on each side of the boiler, then return on each side through the two lower flues, and finally be led into the bottom flue and thence to the chimney. By this arrangement, the hot draughts are not only most advantageously applied to the external and internal surface of the boiler, but the feed water is heated in the tanks which invest the longitudinal flues. When two or more cylindrical boilers are disposed side by side (by preference) the intermediate space or spaces between them should be occupied by water tanks supported by brickwork, instead of forming separate tanks to each boiler, although if desired, each boiler may have separate side tanks.

[Printed, 8*d*. Drawing.]

A.D. 1863, July 31.—Nº 1900.

STEWART, Robert.—This invention relates to a mode of operating the cut-off valves of steam engines. The valve chest is circular and cast in two horizontal concentric shells with an annular space between; this space is divided by two longitudinal partitions, somewhat below the plane of the centre, opposite which in each side, the steam ways are cut through the inner shell, forming a communication between the upper division of the annular space, and the central valve chamber; the apparatus causes a partial turning of the valve, so as to bring the passages formed through its periphery more or less coincident with the steam ways. The valve spindle enters the case through suitable stuffing boxes; the spindle arm is fixed to and suspends from the spindle; a sleeve is formed at the end of the arm in the direction of its length, wherein rests with its pointed end projecting downwards, a weighted pin which has liberty to rise and fall. The end of this pin engages more or less with dogs, which move to and fro, as the end of the excentric rod to which they are fixed is raised and depressed by a lever in connection with the governor. Opposite the centre two pieces project laterally from the spindle arm, to each of which is fixed an upright rod. The upper ends of these rods are furnished with hooks, which catch a cross-head attached to the rod of a small piston operating in a small steam cylinder above the apparatus, whereby the sliding pin in the sleeve on the spindle arm is suddenly brought

to a vertical position, and thereby the steam is cut off simultaneous with the escapement of the pin from contact with the dogs. The steam can be cut off at any point of the stroke or be made to follow the piston any distance in the main cylinder by using the full throw of the excentric.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 1.—N° 1904.

TAYLOR, George.—This invention relates to shaping and flanging boiler and other wrought iron plates, and in the mechanical apparatus employed for the purpose. Instead of, as heretofore, heating in a furnace and hammering down the parts of those plates required to be flanged, according to this invention the plates are taken as they come from the rolls, and (after in some cases reheating) are placed between dies in a press, worked either by screw levers or hydraulic pressure. The bottom die is fashioned to the required internal size and intended shape of the plate, and the outer or surrounding die is of the same configuration, but so much larger as to leave a space the thickness of the plate between the contiguous surfaces when the die is brought down to its work. The plate being of the required heat is placed upon the bottom die, and pressed upon by a strong plate for the purpose of holding it in its place during the operation, and also to prevent its buckling or bending. The dies are made in segmental divisions, so as to be capable of expansion, or divergent and convergent action, in order to operate on plates of varied size. The position of the several segmental sections of the dies, each of which is fitted to a separate radiating slide, is regulated by screws.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, August 1.—N° 1907.

BRADSHAW, Thomas.—(*Provisional protection only.*)—This is an invention which conbines a steam boiler and engine with an apparatus used for public amusement, such as "dobby horses," and "flying and swinging boats." The main central pillar, supporting the framework and "horses," constitutes at its base an ordinary vertical steam boiler, and at its upper half, the chimney, around which broad flanges are secured for the purpose of supporting the stay rods and arms which carry the annular framing

to which the horses are suspended or attached. "These rods "are connected together, and are caused to bear upon the surface "of the flue or central pillar, around which they revolve upon "bowls or pulleys, one set of bowls bearing upon the afore- "mentioned flange in a vertical position, and the other set "pressing and bearing upon the exterior surface of the pillar or "flue, a revolving motion around such central pillar being given to "the rods or arms . . . . by means of a vertical shaft supplied with "an adjustable compensating pinion gearing into a wheel secured "to and driving the rods bearing upon the central pillar; this "vertical rod or driving shaft obtains motion through the medium "of bevil gearing in connection with a small engine fixed in a "convenient position upon the said vertical boiler, and by such "or similar combination of mechanism steam power may be "applied to flying or swinging boats."

[Printed, 4*d*. No Drawings.]

A.D. 1863, August 4.—N° 1922.

BURY, Samuel, and PRICE, John.—This is an invention which relates to the construction of valves for steam engines. It is exhibited and described in its application as a throttle valve, and consists of two ordinary conical or other valves, one acting above and the other beneath a horizontal partition which divides the valve box. These two valves are connected outside the box to the ends of a centrally balanced lever by means of vertical rods, which work up and down through ordinary stuffing boxes on the valve box cover. One end of the lever is also connected to and acted upon by the slightest alteration in the position of the sliding sleeve of the governor, whereby both valves are operated simultaneously either to open or close, so that the steam which first enters the lower compartment of the valve box, is regulated with precision on its passage through the valves to the upper compartment, whence it is supplied to the cylinders.

[Printed, 8*d*. Drawing.]

A.D. 1863, August 6.—N° 1938. (* *)

PINÈDE, Joseph Gustave.—"Improvements in apparatus "for regulating the speed of steam and hydraulic engines."

These improvements consist in two arrangements of apparatus termed valve cocks. The first is composed of a metal elbow pipe

or casing, and a square-shaped valve pinned on an axle and placed in the centre of the pipe in a cylindrically-bored part. A stuffing box and gland or lid forms the joint, and serves to support the axle of the valve. At the part opposite the stuffing box gland is a bronzed stopper fixed by screws, serving to receive the end of the axle of the valve, and to stop the bored part in which the valve is adjusted. In the second arrangement the minor details are modified without affecting the principle.

[Printed, 8*d*. Drawing.]

A.D. 1863, August 6.—N° 1946.

KIRKHAM, John.—The object of this invention is to generate steam economically, and maintain it at an increased or diminished intensity at pleasure, so as to render it applicable to the smelting of metals, the generation of steam, the heating of air for hot blasts, and the generation of gas, and to be capable of effecting simultaneously two or more of these operations in the same apparatus.

The invention is described in its application to the smelting of iron or granulated ore known as "Taranaki sand," and consists of a reverberatory furnace, in connection by means of suitable flues, with a gas generating furnace on each side, a retort oven at back, an air heating chamber, and a steam boiler. The gas generators are each fitted at top with a closed hopper, whence the fuel is allowed to fall upon the burning heap as often as required. The fuel is fired at the bottom, and combustion is maintained by a current of air kept up by a fan. This air descends through the fuel, to the incandescent portion of which small jets of steam are introduced through suitable pipes from the adjacent boiler. The steam decomposed and resolved into its constituent gases mingles with the gaseous products from the burning fuel, and passes therewith through the flues into the smelting furnace, mixed with an additional supply of hot air and hydrogen gas, which is introduced in the flues. The inflammation of these gaseous streams produces intense heat in the reverberatory smelting furnace, which may be regulated at pleasure by the valves which govern the admission of the heated air. From the furnace the burning fire draught passes first into a flue chamber wherein a number of retorts, which supply the hydrogen gas, are mounted; thence into a chamber beyond, which contains the

pipes for heating the currents of air which pass through them, and finally into the flues of a steam boiler, wherein the steam supplied to the apparatus is generated.

[Printed, 1s. 10d. Drawings.]

A.D. 1863, August 7.—N° 1949. (* *)

JONES, William. — "Improvements in steam boilers," "designed for the purpose of dispensing with the usual firing "hole through the inner and outer case of vertical" "boilers or "in horizontal boilers where vertical fire-boxes are employed." The fire-grate and bars are made movable, being mounted in a framing connected with a forked lever carrying the grate by suspension links on each side. Slides are provided for guiding the grate up and down.

[Printed, 10d. Drawing.]

A.D. 1863, August 7.—N° 1956.

PLATT, James.—(*Provisional protection only.*)—This invention relates to apparatus for supplying steam boilers with water. A closed vessel is superposed in a convenient position above the boiler, and placed within another vessel or reservoir, into which the supply water first flows. The two vessels communicate by means of a valve which opens inward; the end of the supply pipe which connects the boiler with the inner vessel, dips into the water contained in the latter; there is also in connection with the supply pipe a valve interposed, which closes by the boiler pressure. A steam pipe forms a communication between the upper part of the vessel and the boiler steam space; this pipe is opened and closed by a valve which is operated by a float in the boiler whenever the water therein sinks below the working level; also in the inner vessel there is a small float, which operates a steam escape valve at the top. When the water in the boiler falls below its proper level, the sinking of the small float opens the steam valve and admits steam to the vessel, and as soon as the steam pressure therein is in equilibrio with the pressure in the boiler, the water flows into the latter until the boiler float rises and shuts off the steam. After a short time the steam contained in the inner vessel either becomes condensed, or by the sinking of the small float the way is opened for it to escape by the valve, and

adjusting weighted lever, and pushes back a horizontal lever into a retaining notch in a quadrant which is attached to the door frame. This lever carries a stud, whereto is hinged a connecting rod, which opens and closes the air valve under the bridge, and also moves a bar inside the front of the furnance, called a combustion bar. The weighted lever carries a box or chamber containing shot or mercury. It is divided into two compartments by a hinged door or grating, through which the mercury or shot slowly passes after the furnace door is closed, causing a gradual fall of the weighted lever, whereby at the proper time, the horizontal lever retained by the quadrant is disengaged, and by a spring forced along the quadrant, thereby acting on the connecting rod which closes the valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 20.—N° 2066.

GALLOWAY, William, and GALLOWAY, John.—This invention relates to the construction of steam boilers, and steam, and water gauges. As regards boilers it is supplementary to a prior invention for which Letters Patent bearing date 11th of March 1851, No. 13,552 were granted to these inventors, but were subsequently in part disclaimed. According to the present invention, two cylindrical tubes of different diameters, or two sets of tubes are horizontally disposed a certain distance apart, one below the other, the upper tubes being the largest; these tubes are united at intervals by a number of tapering flanged pipes, which form a series of vertical water communications between the tubes: in some cases, where two or more sets of upper and lower tubes are employed, the tapering pipes are so disposed as to form diagonal connections between them, the whole arrangement being united by a steam cylindrical chamber, which is placed crosswise above the upper tubes, supported by short tubes which communicate respectively with each. Various arrangements of horizontal tubes and tapering vertical and diagonal connecting pipes are exhibited and described as modifications of the invention. The apparatus is enclosed within brickwork. The fire bar surface is placed on a suitable inclination between the upper and lower tubes, and in some cases below the latter.

With regard to valves the invention "consists in placing a disc "or a number of discs of brass or other suitable material in a "space formed above or below the india-rubber diaphragm of

"ordinary gauges, so that the pressure of the steam is exerted "upon such discs in addition to the india-rubber, whereby the "number and thickness of the discs which are employed are made "to regulate the degree of pressure which the gauge is capable of "indicating." It also consists in providing water gauges with "plug valves" instead of the ordinary taps, in order that when the plug valves are turned, the water passages may be cleared and any accumulation of scale and deposit in the boiler prevented.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, August 27.—N° 2116.

PRAGST, Francis.—This invention, relating to steam engines and utilizing steam, consists (1.) in arranging at opposite sides of a wall, two oscillating cylinders to act with conjoint action upon fly wheels mounted upon each end of a shaft which passes through the wall. The cylinders carry guides for steadying the piston blocks, which are coupled to crank pins respectively fixed, a suitable radial distance from the axis, in the arms of the fly wheels, whence by means of gearing on the periphery of one of the wheels, motion is communicated to the working shaft. 2. Fixing the condenser and air pump to the cylinders, so that they all oscillate together upon the same centre of vibration. 3. Working the hot water pumps by levers or links connected to the condenser, motion being given to the pump piston rod through oscillating levers, the ends of which are jointed to the links. 4. Arranging for conjoint action a compound high and low pressure engine; the high and low pressure cylinders are placed at each side of a wall or otherwise, operating respectively upon crank pins fixed in fly wheels mounted on each end of an intermediate shaft: the pipe which conveys the steam from the high to the low pressure cylinder being rectilineally disposed on the plane of the centre of oscillation and vibrating with the cylinders. 5. Relates to the use of flexible pipes in connection with oscillating cylinders for conveying the inlet and the exhaust steam. 6. Relates to utilizing steam, which after it has operated in a high-pressure cylinder, is partly discharged through pipes suitably disposed in buildings, for heating the same, or is made to impart its heat to feed water for boilers, or to fluids for other purposes, being afterwards passed through a low-pressure cylinder and thence to a condenser, or to the latter only; or heated feed water may be

adjusting weighted lever, and pushes back a horizontal lever into a retaining notch in a quadrant which is attached to the door frame. This lever carries a stud, whereto is hinged a connecting rod, which opens and closes the air valve under the bridge, and also moves a bar inside the front of the furnance, called a combustion bar. The weighted lever carries a box or chamber containing shot or mercury. It is divided into two compartments by a hinged door or grating, through which the mercury or shot slowly passes after the furnace door is closed, causing a gradual fall of the weighted lever, whereby at the proper time, the horizontal lever retained by the quadrant is disengaged, and by a spring forced along the quadrant, thereby acting on the connecting rod which closes the valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 20.—N° 2066.

GALLOWAY, William, and GALLOWAY, John.—This invention relates to the construction of steam boilers, and steam, and water gauges. As regards boilers it is supplementary to a prior invention for which Letters Patent bearing date 11th of March 1851, No. 13,552 were granted to these inventors, but were subsequently in part disclaimed. According to the present invention, two cylindrical tubes of different diameters, or two sets of tubes are horizontally disposed a certain distance apart, one below the other, the upper tubes being the largest; these tubes are united at intervals by a number of tapering flanged pipes, which form a series of vertical water communications between the tubes: in some cases, where two or more sets of upper and lower tubes are employed, the tapering pipes are so disposed as to form diagonal connections between them, the whole arrangement being united by a steam cylindrical chamber, which is placed crosswise above the upper tubes, supported by short tubes which communicate respectively with each. Various arrangements of horizontal tubes and tapering vertical and diagonal connecting pipes are exhibited and described as modifications of the invention. The apparatus is enclosed within brickwork. The fire bar surface is placed on a suitable inclination between the upper and lower tubes, and in some cases below the latter.

With regard to valves the invention "consists in placing a disc "*or a number* of discs of brass or other suitable material in a "*space* formed above or below the india-rubber diaphragm of

"ordinary gauges, so that the pressure of the steam is exerted "upon such discs in addition to the india-rubber, whereby the "number and thickness of the discs which are employed are made "to regulate the degree of pressure which the gauge is capable of "indicating." It also consists in providing water gauges with "plug valves" instead of the ordinary taps, in order that when the plug valves are turned, the water passages may be cleared and any accumulation of scale and deposit in the boiler prevented.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, August 27.—N° 2116.

PRAGST, Francis.—This invention, relating to steam engines and utilizing steam, consists (1.) in arranging at opposite sides of a wall, two oscillating cylinders to act with conjoint action upon fly wheels mounted upon each end of a shaft which passes through the wall. The cylinders carry guides for steadying the piston blocks, which are coupled to crank pins respectively fixed, a suitable radial distance from the axis, in the arms of the fly wheels, whence by means of gearing on the periphery of one of the wheels, motion is communicated to the working shaft. 2. Fixing the condenser and air pump to the cylinders, so that they all oscillate together upon the same centre of vibration. 3. Working the hot water pumps by levers or links connected to the condenser, motion being given to the pump piston rod through oscillating levers, the ends of which are jointed to the links. 4. Arranging for conjoint action a compound high and low pressure engine; the high and low pressure cylinders are placed at each side of a wall or otherwise, operating respectively upon crank pins fixed in fly wheels mounted on each end of an intermediate shaft: the pipe which conveys the steam from the high to the low pressure cylinder being rectilineally disposed on the plane of the centre of oscillation and vibrating with the cylinders. 5. Relates to the use of flexible pipes in connection with oscillating cylinders for conveying the inlet and the exhaust steam. 6. Relates to utilizing steam, which after it has operated in a high-pressure cylinder, is partly discharged through pipes suitably disposed in buildings, for heating the same, or is made to impart its heat to feed water for boilers, or to fluids for other purposes, being afterwards passed through a low-pressure cylinder and thence to a condenser, or to the latter only; or heated feed water may be

pipes for heating the currents of air which pass through them, and finally into the flues of a steam boiler, wherein the steam supplied to the apparatus is generated.

[Printed, 1s. 10d. Drawings.]

A.D. 1863, August 7.—N° 1949. (* *)

JONES, William. — "Improvements in steam boilers," "designed for the purpose of dispensing with the usual firing "hole through the inner and outer case of vertical" "boilers or "in horizontal boilers where vertical fire-boxes are employed." The fire-grate and bars are made movable, being mounted in a framing connected with a forked lever carrying the grate by suspension links on each side. Slides are provided for guiding the grate up and down.

[Printed, 10d. Drawing.]

A.D. 1863, August 7.—N° 1956.

PLATT, James.—(*Provisional protection only.*)—This invention relates to apparatus for supplying steam boilers with water. A closed vessel is superposed in a convenient position above the boiler, and placed within another vessel or reservoir, into which the supply water first flows. The two vessels communicate by means of a valve which opens inward; the end of the supply pipe which connects the boiler with the inner vessel, dips into the water contained in the latter; there is also in connection with the supply pipe a valve interposed, which closes by the boiler pressure. A steam pipe forms a communication between the upper part of the vessel and the boiler steam space; this pipe is opened and closed by a valve which is operated by a float in the boiler whenever the water therein sinks below the working level; also in the inner vessel there is a small float, which operates a steam escape valve at the top. When the water in the boiler falls below its proper level, the sinking of the small float opens the steam valve and admits steam to the vessel, and as soon as the steam pressure therein is in equilibrio with the pressure in the boiler, the water flows into the latter until the boiler float rises and shuts off the steam. After a short time the steam contained in the inner vessel either becomes condensed, or by the sinking of the small float the way is opened for it to escape by the valve, and

water is again admitted from the outer reservoir, which in turn is again replenished from the water supply, and so on the operation is repeated whenever by the sinking of the boiler float the steam valve is opened.

[Printed, 4*d.* No Drawings.]

A.D. 1863, August 15.—N° 2023.

SCOTT, EDWARD.—(*A communication from Arnold Winder.*)—This invention relates to apparatus, actuated by an ordinary governor, for regulating the speed of the driving shafts of steam or other engines. Conveniently near the main driving shaft a frame is placed in which are two horizontal V grooves; two sliding plates, one moving in each groove, are fitted to slide to and fro; these plates are a short distance apart, and the surfaces which they present to each other are formed in steps so as to leave an irregular space between the two plates; in this space there is a rod which has reciprocating motion imparted to it by means of an eccentric on the governor spindle, and it is furnished with suitable projections for engaging the steps in the plates; the end of the rod is raised or depressed by a curved lever, the motions of which alternate in accordance with the variations in speed and the movements of the sliding sleeve on the governor spindle by which it is actuated. The upper sliding plate is connected to a strap fork, which regulates the positions of the driving strap upon the pulleys, and so governs the speed of the shaft. The motion is reversed by the use of pulleys and mitre wheels.

[Printed, 10*d.* Drawing.]

A.D. 1863, August 17.—N° 2042.

LOFTUS, THOMAS.—This invention, which relates to the consumption of smoke, consists of apparatus for admitting air to the furnaces and flues of steam boilers, by means of a horizontal door under the dead plate, and a valve under the bridge, which is constructed of metal and made hollow, the air passing out into the entrance to the flues through numerous apertures in the upper surface of the bridge, which becomes heated to a red heat.

The air commingled with the inflammable gases generated in the furnace, ignites and causes the consumption of the smoke. The apparatus is operated by the opening of the furnace door, which by means of a projecting piece and chain, elevates a self-

adjusting weighted lever, and pushes back a horizontal lever into a retaining notch in a quadrant which is attached to the door frame. This lever carries a stud, whereto is hinged a connecting rod, which opens and closes the air valve under the bridge, and also moves a bar inside the front of the furnance, called a combustion bar. The weighted lever carries a box or chamber containing shot or mercury. It is divided into two compartments by a hinged door or grating, through which the mercury or shot slowly passes after the furnace door is closed, causing a gradual fall of the weighted lever, whereby at the proper time, the horizontal lever retained by the quadrant is disengaged, and by a spring forced along the quadrant, thereby acting on the connecting rod which closes the valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 20.—N° 2066.

GALLOWAY, WILLIAM, and GALLOWAY, JOHN.—This invention relates to the construction of steam boilers, and steam, and water gauges. As regards boilers it is supplementary to a prior invention for which Letters Patent bearing date 11th of March 1851, No. 13,552 were granted to these inventors, but were subsequently in part disclaimed. According to the present invention, two cylindrical tubes of different diameters, or two sets of tubes are horizontally disposed a certain distance apart, one below the other, the upper tubes being the largest; these tubes are united at intervals by a number of tapering flanged pipes, which form a series of vertical water communications between the tubes: in some cases, where two or more sets of upper and lower tubes are employed, the tapering pipes are so disposed as to form diagonal connections between them, the whole arrangement being united by a steam cylindrical chamber, which is placed crosswise above the upper tubes, supported by short tubes which communicate respectively with each. Various arrangements of horizontal tubes and tapering vertical and diagonal connecting pipes are exhibited and described as modifications of the invention. The apparatus is enclosed within brickwork. The fire bar surface is placed on a suitable inclination between the upper and lower tubes, and in some cases below the latter.

With regard to valves the invention "consists in placing a disc " or a number of discs of brass or other suitable material in a " space formed above or below the india-rubber diaphragm of

"ordinary gauges, so that the pressure of the steam is exerted "upon such discs in addition to the india-rubber, whereby the "number and thickness of the discs which are employed are made "to regulate the degree of pressure which the gauge is capable of "indicating." It also consists in providing water gauges with "plug valves" instead of the ordinary taps, in order that when the plug valves are turned, the water passages may be cleared and any accumulation of scale and deposit in the boiler prevented.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, August 27.—N° 2116.

PRAGST, FRANCIS.—This invention, relating to steam engines and utilizing steam, consists (1.) in arranging at opposite sides of a wall, two oscillating cylinders to act with conjoint action upon fly wheels mounted upon each end of a shaft which passes through the wall. The cylinders carry guides for steadying the piston blocks, which are coupled to crank pins respectively fixed, a suitable radial distance from the axis, in the arms of the fly wheels, whence by means of gearing on the periphery of one of the wheels, motion is communicated to the working shaft. 2. Fixing the condenser and air pump to the cylinders, so that they all oscillate together upon the same centre of vibration. 3. Working the hot water pumps by levers or links connected to the condenser, motion being given to the pump piston rod through oscillating levers, the ends of which are jointed to the links. 4. Arranging for conjoint action a compound high and low pressure engine; the high and low pressure cylinders are placed at each side of a wall or otherwise, operating respectively upon crank pins fixed in fly wheels mounted on each end of an intermediate shaft: the pipe which conveys the steam from the high to the low pressure cylinder being rectilineally disposed on the plane of the centre of oscillation and vibrating with the cylinders. 5. Relates to the use of flexible pipes in connection with oscillating cylinders for conveying the inlet and the exhaust steam. 6. Relates to utilizing steam, which after it has operated in a high-pressure cylinder, is partly discharged through pipes suitably disposed in buildings, for heating the same, or is made to impart its heat to feed water for boilers, or to fluids for other purposes, being afterwards passed through a low-pressure cylinder and thence to a condenser, or to the latter only; or heated feed water may be

obtained by introducing a jet of condensing water into the passage pipe between the high and low pressure cylinders.

[Printed, 1s. 10d. Drawings.]

A.D. 1863, August 28.—Nº 2130.

WALLS, Joseph.—(*Letters patent void for want of final specification.*)—This invention, relating to steam boilers and apparatus connected therewith, consists—

1st. "In an improved arrangement of steam boiler. I employ "one or more short boilers having fire-boxes similar to those in a "two-flued boiler. At the back of each fire-box there is a bridge, "and at the back of each small boiler a large flue of brickwork, "which contains a number of pipes bent like a syphon, which "pipes have their legs connected to a shell or casing, or one row "of legs connected to one shell or casing, and the other row of "legs connected to another shell or casing. The syphon pipes "are full of water, and the shells contain water and steam, and to "the tops of the shells are connected the domes, steam pipes, and "apparatus usually connected to boilers. In some cases I employ "some of the syphon pipes for heating the feed water before it "enters the water, and the pipes are kept clean by wire brushes."

2nd. Consists in mechanical arrangements, adapted to all kinds of steam boilers, for making one or more dampers self-acting. Two plans are described; the first operates by means of a float in the boiler, supported by one end of a lever, the other end of which is connected by a rod to a weighted valve in a box, communicating by pipes with another valve box containing a sheet of india-rubber, which being acted upon by the steam pressure, by means of suitable connections, causes the dampers to close when the water is too low. The same result is produced when the water in the boiler is above the working level.

3rd. Relates to a mode of extinguishing the fire in a boiler furnace, when the water in the boiler is below safety mark, by means of a float, which by sinking with the water level, causes the opening of a valve contiguous to the furnace, thereby admitting the water from the boiler upon the fire, whereby it is extinguished.

[Printed, 4d. No Drawings.]

A.D. 1863, August 29.—N° 2137.

WHITWORTH, WILLIAM, and WRIGLEY, JOSEPH.—The object of this invention, which is adapted to the furnaces of steam boilers, is to prevent the wearing away of those parts of the interior of furnaces, which are exposed to the action of the greatest heat. It consists,—

1st. In applying by means of a perforated pipe, suitably disposed underneath the grate bars near the bridge, a jet or jets of steam, which are directed against the underside of the grate, whereby the burning or melting of the grate bars is prevented.

2nd. Relates to constructing the side walls of external boiler furnaces of double metal casing containing water space, which by means of inlet and outlet pipes is put into communication with the water in the boiler. The water circulates through the casing, and thereby protects, by carrying off the heat, the walls of the furnace from its destructive effects. The invention is particularly applicable to furnaces fitted with Jucke's movable grate bars, patented September 4, 1841, No. 9067.

[Printed, 1s. 4d. Drawings.]

A.D. 1863, August 29.—N° 2144.

MARTIN, LOUIS EMILE CONSTANT.—This is an invention of combined apparatus for generating steam and gas, and heating air, which is caused to mingle with the gas: the compound æriform fluid is ignited and burned as fuel to heat a contiguous boiler, or as in the case of a locomotive, to be burnt at the junction of the fire-box with the cylindrical body of the boiler, the flaming products of its combustion passing direct into the boiler tubes.

The boiler shown and described is of the vertical class, divided horizontally into an upper and a lower section, the latter containing a large central chamber, wherein a circular fire-clay retort is concentrically disposed, so that an annular flue is formed within the chamber round the retort, which rests on end over a central furnace, and is fed through an opening in the crown of the boiler, which opening, during the intervals of feeding, is kept carefully closed. The annular water space round the chamber contains numerous water tubes, and below it is a furnace, wherefrom the products of combustion rise to the height of the lower section, and pass through numerous small tubes convergently into and then downwards through the annular space which surrounds the

retort, whereinto they pass through a series of apertures near the base, and rising therein through the fuel distil off the gases, which passing upwards with the hot draught, escape from the retort through side apertures into the upper section of the boiler, which is covered with a hemispherical casing and constitutes the steam space. Thence the gaseous products find their way to a side aperture or chamber, where they meet and are commingled with the heated air. The air comes to this point through air tubes disposed spirally round the upper part of the retort, and also through outer casings or heating passages which extend under and up the sides of the boiler, opening into a side aperture and distributing chamber, wherein by means of a revolving fan, set in motion by the heated air current, the perfect mixture of the air and gases is effected. Thence the compound inflammable fluid is by means of pipes, carried off for use. The fuel at the bottom of the retort may be lighted, and allowed to burn at a low rate.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, September 4.—N° 2185.

HENDRY, John, and COUTTS, William.—(*Provisional protection only.*)—This invention relates to furnaces. It is described as applied to an ordinary horizontal cylindrical boiler, fitted with one longitudinal internal flue. The furnace is disposed at the front end of the boiler, and when applied to small boilers, is externally constructed of brickwork. There is no range of grate bars or ash-pit. The furnace is arched over, and internally from the feed opening at the top, gradually widens towards the lower end, which opens through a throat or channel into a flue extending from front to back under the whole length of the boiler. At the back end of the boiler the flue turns upwards and conducts the hot draughts into the central flue; thence they pass to the front end of the boiler, and there diverge into external side flues, passing round the boiler to the chimney. There are three openings into the front of the furnace at different levels; these openings are closed more or less with doors which regulate the air draught. The upper or largest is for the admission of fuel, the supply of which is kept up to the level of the door. The next opening below is for the purpose of distributing the fuel when it begins to ignite and cake into lumps, and the bottom opening enables the attendant to push the lower or incandescent portion of the fire

forward. An air pipe with a slotted aperture is transversely introduced through the brickwork into the throat channel. The atmosphere is drawn in at both ends of this pipe, and passes through the slotted opening into the throat channel, where it directly meets and mingles with the current of hot draughts and products of combustion from the furnace, thereby causing them to ignite and consume as they pass into the flues. All the gas and smoke evolved in the furnace during the distillation of the coal, passes downward through the hottest portion of the fire.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 5.—N° 2188.

HARGREAVES, George.—The objects to be attained by this invention, which relates to steam boilers, are economy of fuel, rapid generation of steam, and partial prevention of incrustation.

"To the ordinary feed pipe supplying the boiler with water I "attach a cock which communicates with a pipe running through "the flue of the boiler, but under the fire-bars at the front end. "In that part of the flue beyond the fire-bars I coil the pipe "longitudinally with the boiler, or in the ordinary spiral or any "other convenient manner, and causing it to return under the "fire-bars connect it with (by preference) the bottom part of the "front of the boiler. Immediately below the cock above named "I open another communication between the boiler and the feed "pipe by means of a suitable pipe carrying a cock to close the "communication at pleasure."

The action of the apparatus is described as follows:—"Opening "the first-named cock I shut the second; the water circulates "through the pipe under the fire and within the flue; it thus "becomes heated, and entering at the bottom of the boiler, "where the water is ordinarily nearly cold, it raises the tempera- "ture of that with which it mingles, and also creates a certain "amount of agitation which disturbs sediment and prevents or "partially prevents incrustation." When the feed is shut off by closing the first cock, and the second cock is opened; "communi- "cation is now free between the water in the upper part and that "in the lower part of the boiler (a third cock connecting the "lower part of the boiler and the pipe afore-named being closed

"only in case of accident to the said pipe), and the pipe in the "flue being full of water steam is rapidly generated, and finds "its way to the upper part of the boiler by means of the second "cock before-named, and thus reverses the direction of the "current of water, which now rises from the bottom part."

[Printed, 8*d*. Drawing.]

A.D. 1863, September 7.—N° 2201.

NEWTON, ALFRED VINCENT.—(*A communication from Andrew Buchanan, and William Alexander Righter.*)—This invention relates to mechanical devices for directing motion in right lines. It is illustrated and described as applied to the slide valve of a steam engine. The valve chest is of the ordinary construction, excepting that a square opening is centrally formed in the cover for the reception of the lower end of a cast-iron standard which fits endwise therein and rests upon adjusting screws screwed into projecting lugs and set down upon the valve chest cover; the upper end of the standard is made fast by an adjusting screw in the top of a casing which fits down upon the steam chest and encloses the standard; through the top of the latter there is a transverse vertical slot guide, and through the lower end which is made wider, there is a horizontal curved slot guide formed through it in a transverse direction: the lower ends of two vertical levers (one on each side of the standard) are jointed to the back of the slide valve; the upper ends of these levers are connected by a pin, upon which between the levers there is a small slide block which works in the vertical slot formed through the top of the standard; another sliding block curved in conformity with the curve of the slot formed through the bottom of the standard is mounted in the slot upon a pin the ends of which are carried by the side levers. As the slide valve moves to and fro on the plane of its seating, the small slide block works up and down in the vertical slot, whilst the curve described by the curved slide block consists of arcs of varying radii with which the configuration of the curved slot must coincide, and to which the curved slide block may be so accurately fitted and adjusted, assisted by a slight degree of flexibility in the top of the casing, as to cause the slide block to sustain a portion of the weight of the steam pressure which would otherwise fall upon the back of the valve. If instead of being jointed to the back of the slide valve, the

lower ends of the levers were jointed to any other moving body, such body would obtain rectilineal motion therefrom.

[Printed, 8*d*. Drawing.]

A.D. 1863, September 9.—N° 2221. (* *)

ROBINSON, John.—(*Provisional protection only.*)—" Improve-" ments in " " furnaces." The fire-bridge is made hollow and it communicates with " the ash-pit below and under a dead plate, " upwards over the dead plate at the back end of the fire-bars, " where such " " passages open in a direction towards the mouth " " of the fire-place." As the air passes " out therefrom into the " fire-place," it is caused to meet the " products of combustion " as they pass over such fire-bridge."

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 9.—N° 2225.

HUTCHINSON, William.—(*Provisional protection only.*)—This invention relating to steam engines, consists in the application of apparatus between two cylinders, whereby motion can be communicated to an intermediate crank, and parallel motion secured for the piston rods. It comprises a fixed wheel with internal teeth which engage with a pinion carried by the crank. To this pinion the piston rod is connected, the required parallel motion being obtained as the pinion rolls round the internal gearing of the fixed wheel; both the cylinders may be steam working cylinders, or one of the two may either act as an air, a forcing, or a lifting pump. The cylinder cover or covers are constructed in or with the part which carries the internal wheel and crank pedestal, and also the foundation plate; a flange is formed upon the pinion and the crank pin cast thereon; the central crank pin is formed conical with the smaller part of the journal next to the crank; the mounting cap of the piston rod is made with a double adjustment to apply to both cylinders; the steps of the central crank pin are made in two parts bored conical to suit the pin; the central stationary wheel is constructed with a loose cap provided with snugs to prevent its revolving, or it may be held by screws for the purpose of adjustment to compensate for wear.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 9.—N° 2226.

NEWTON, Alfred Vincent.—(*A communication from Henry Waterman.*)—This invention relating to steam engines, consists in lining the interior of the steam cylinder with metal surfaces heated by steam from an auxiliary boiler at about 100° of pressure (Fah. scale) above the working pressure in the boiler. The linings of the cylinder ends, are formed with two circular plates of steel, about one-tenth of an inch thick, packed about one inch and a quarter apart by a ring, and fixed thereto steam tight with through rivets which secure the plates on each side; the whole superficial area of the plates is likewise supported by hollow packings through which, a suitable distance apart, rivets pass and secure the plates. The sides of the cylinder are lined in the same way; the plates which form the circumferential linings are true segments of a circle held together by longitudinal metal strips, to which the plates are fixed by through rivets, the heads of which are cleaned off fair and smooth, so as not to interfere with the passage of the piston; the intermediate surfaces are supported by intervening feathers or packings and secured by rivetting through. Suitable pipes are attached to the heaters for communicating with the auxiliary boiler. Watery particles in the cylinder are evaporated by the heat of the surrounding linings, which may if required be heated with currents of hot air.

[Printed, 10*d*. Drawing.]

A.D. 1863, September 15.—N° 2263. (* *)

BARCLAY, Andrew. — (*Provisional protection only.*)—" Im-" proving the draught in the funnels of locomotives" or of similar steam engines, by causing the two exhaust pipes to open into a receiver placed in the smoke box or funnel. The upper part of this receiver is perforated with holes fitted with conical jets. It "may be applied to vertical or horizontal boilers," the shape of the chamber being modified as required.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 19.—N° 2316.

BATEMAN, Hyde.—(*Provisional protection only.*)—This invention relates to a rotary engine in which steam may be worked expansively. "The engine shaft, which carries the rotating " piston, is mounted concentrically in the cylinder, and it is made

" hollow, having two longitudinal passages, the one for admitting " and the other for exhausting the steam. The piston, which " projects radially from the shaft, sweeps round the cylinder, and " in its course forces back into suitable recesses a pair of hinged " stops, which serve alternately to separate the supply from the " exhaust steam in the cylinder. The engine shaft rotates in two " steam boxes which respectively connect with the steam boiler " and the condenser, or it may be with the atmosphere, and the " supply and exhaust passages within the shaft communicate " with these boxes respectively, so as to provide for the proper " supply of steam to the engine, and for the proper exhaust. " The supply face of the piston is grooved from end to end to " form an inlet channel for the steam, and for which purpose it " communicates wlth the inlet passage of the shaft, and the " exhaust face of the piston is also grooved to form, with a lateral " opening in the shaft, a suitable exhaust outlet. The hinged " stops have a tendency to press inwards, which is produced " by springs or otherwise, and thus they will not only bear against " the shaft when that is presented to them, but also against the " faces of the piston, thereby dividing the supply and exhaust " steam in the cylinder, the continued rotation of the piston " throwing the supply steam alternately on to the opposite sides " of the stops. The piston is fitted with elastic packing to ensure " its fitting tightly against the periphery and ends of the cylinder, " and suitable provision is also made for the lateral expansion of " the hinged stops. The hinge preferred for the stops is a barrel " hinge working in an adjustable bearing. To facilitate the " passing of the stops by the rotating piston, a curved project- " ing piece is fitted to the piston to slide over the face of the " stops, and press them back into their recesses."

[Printed, *4d.* No Drawings.]

A.D. 1863, September 25.—N° 2363.

NEWTON, ALFRED VINCENT—(*A communication from John Van Voorst Booraem.*)—(*Provisional protection only.*)—The object of this invention, which relates to a mode of fixing the tubes of surface condensers, "is to provide for the removal of any one of " the tubes of a condenser, for repair or any other purpose, with- " out disturbing the others, and at the same time, to provide for " the free longitudinal expansion of the tubes; and to this end " it consists in forming the joint between a tube and tube sheet

"by means of a thimble passing over the end of the tube and "screwing into the tube sheet, and a ring or gasket of india-"rubber or other packing material, which is inserted into a "cavity in the sheet and compressed around the tube by means "of the thimble in such manner as to make a steam-tight joint "but freely permit the longitudinal expansion of the tube. The "central opening of the thimbles is circular in form at the inner "end for the reception tube, but of square or other polygonal "form at the outer end for the reception of a wrench or key by "which to screw the thimble into its place."

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 25.—N° 2365.

LLOYD, Edward.—(*Provisional protection only.*)—This is an invention of rotating engines or wheels to be worked by water, steam, or other motive power. It relates (1.) to wheels to be worked by water, which enters at the axis and passes through radiating curved passages to the periphery, near to which the curve of each passage turns backwards in which direction the water is discharged; valves are suitably arranged in each of the passages to regulate the supply. 2. Relates to rotating wheels impelled by the pressure of steam or other elastic fluid, the object being to obtain by reaction, all or nearly all the elastic power of the fluid, which is caused to enter at the axis of the wheel and pass to the periphery through a volute curved channel which also takes a backward turn near the periphery and opens therethrough in the contrary direction; a regulating valve is placed near to the turn in the curve, and a case for preventing condensation from exposure of the parts, encloses the apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 26.—N° 2375. (* *)

WILSON, Edward Brown.—(*Provisional protection only.*)—"Furnaces and fire-places applicable to the heating of steam "boilers and other purposes" are worked with "a down draught," "the fuel being caused to burn from the surface downwards." With a locomotive "a transverse midfeather descends to within" a short distance "from the bottom of the fire-box," which "consists of a closed water space." The front of the box receives the fuel through a door-way at the upper part; and the

combustion chamber is formed between the midfeather and the tubes. Heated air is supplied to the top of the fuel from a pipe passing through the smoke box; and a supply of air "is also "introduced into the combustion chamber" "through tubular "stays" and in some cases at different levels below the surface of the fuel. The furnaces of stationary and marine boilers are similarly arranged.

With an ordinary fire-place its front part "is divided from the "back part by a partition descending to within a few inches of "the bottom of the plate" which is closed. The fuel is supplied in the back chamber and burned downwards.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 28.—N° 2377.

JEAN, Louis Joseph Joachin.—This invention relates to the fire-grates and tubes of steam boilers. It is described as applied to a vertical boiler. The body of the boiler is filled with vertical tubes disposed in concentric circles; the upper ends being bent outwards, are set into the upper part of the sides of the boiler, and the lower ends of these tubes are set into a horizontal tube plate which constitutes the top of the furnace. The sides of the boiler are inclosed by a metal casing, which forms a surrounding flue, whereinto the products of combustion pass from the bent ends of the tubes, and take a downward course to the chimney flue.

The fire-bars are ranged on a circular frame, mounted on a horizontal carriage, which by means of worm gearing round the frame is caused to revolve, being actuated by a worm on a shaft, whereon is a small differential speeded strap pulley. A hopper supplies fuel to the furnace in regulated quantities, and a revolving projector furnished with radiating arms or wings, distributes it over the burning fuel. The hopper and feeding apparatus are disposed on a carriage, which is mounted on rails in front, so that it can be withdrawn whenever it is necessary. Air is admitted to the underside of the fire-bars through suitable openings.

Modifications of the invention, as adapted to a locomotive, a double furnace marine boiler, and a stationary boiler, are shown and described.

[Printed, 8*d*. Drawing.]

A.D. 1863, September 28.—N° 2383.

BAILEY, John, BLAKE, George William, and BAILEY, William Henry.—This invention relates to steam pressure gauges, barometers, gas regulators, and apparatus for regulating and indicating the flow and pressure of liquids and fluids. It consists, 1st, in using two kinds of metal in the construction of the tubes employed in "Bourdon's" steam pressure gauges, one side of such tubes being of brass, and the other side of steel, whereby a greater deviation is obtained when the tubes are subjected to pressure or heat. The brass employed consists of an alloy composed of 275 parts of copper, 10 parts of aluminium, and 95 parts of zinc.

2ndly. Applying "Bourdon's" tubes to John and William H. Bailey's weight gauge, described in the Specification of Letters Patent granted to them December 6th, 1861, No. 3058, such tubes being used to actuate the finger on the dial, instead of the piston and diaphragm described.

3rdly. Relates to the construction of dial pressure gauges for indicating low pressures. The cases of these gauges are cast in three principal parts; the indicator is moved by a float confined in a tin tube, which serves as a guide and supports the case. The float is furnished with a rack, which operates the finger pinion. Anemometers are constructed according to a modification of this part of the invention.

4thly. This part relates to the construction of regulators for gas burners.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, October 2.—N° 2415. (* *)

TEES, James.—(*Provisional protection only.*)—"Improvements "in packing for stuffing-boxes and pistons."

This invention is specially applicable to a kind of packing in common use, which "consists of a ring formed of canvas with "vulcanized india-rubber embedded therein, and having a cover-"ing of wire cloth upon the rubbing surface . . . One improve-"ment consists in making the material for the rubbing surface "of wire and woollen or worsted threads interwoven, instead of "being of metal alone, . . . or vegetable fibre may be used. "The canvas used in the construction of the ring is usually

"prepared with a mixture containing grease, black lead, sulphur, "and alum, but by the present invention rosin is used instead of "the sulphur and alum."

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 5.—N° 2429.

HOEHL, William, BRAKELL, Christopher, and GÜNTHER, William.—This invention relates to rotary engines which act by the momentum of the moving agent. They are adapted to steam, water, or other motor, and consist of inward and outward flow turbine wheels, wherefrom greater efficiency results than can be obtained by a single wheel moving at the same speed. The steam or other motive agent is passed successively through a pair or pairs of turbine wheels in such manner that the succeeding wheel receives the steam as it passes from the foregoing one. The velocity of the fluid in passing through the wheels is much less than when as in the case of a single wheel it is allowed to escape direct to the atmosphere or to the condenser, which will be found an advantage, as the effect of high velocity is produced by running at a moderate speed. The wheels are disposed concentric with each other with an enclosed annular space between them in which the steam enters after having passed the inward flow wheel, whence it passes divergently through the buckets of the outward flow wheel and thence to the exhaust, or if desirable through another pair or series of similar inward and outward flow wheels.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 5.—N° 2430.

BRAKELL, Christopher, HOEHL, William, and GÜNTHER, William.—(*Partly a communication from Albert Westfield.*)—(*Provisional protection only.*)—This invention relates to motive power engines (1), improvements in "Schiele's turbines" which consist in the use of slides for opening and closing the supply passage to the water ports, and operating such slides by an inclined slot and ring, forming part of the rim of a toothed wheel, which is either revolved by a pinion and handle, or by the governor. Turning more or less in one direction raises the slides in succession, and by turning the opposite way they are gradually, one after the other, closed. 2, relates to regulating the action of

expansion valves of steam engines. Fixed to the rocking shaft is a slotted lever, in the slot of which there is a block jointed to one end of a connecting rod, the end being coupled to the lever which works the valve. Connected to the block is a link or double strap with a rack on one side, which works into a toothed sector fixed to an arm loose upon the shaft, and connected by a rod with the governor. When the speed increases the arm is raised, whereby the sector is turned and the rack raised, which moves the block to a longer radius in the slot of the lever, and thereby increases the length of the movement and consequently the action of the valve. The effect is reversed by the parts acting contrariwise when the engine is working at a diminished speed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 5.—N° 2437.

IVORY, THOMAS.—This invention relates to steam engines, boilers, and furnaces. In respect to steam engines, two cylinders and pistons are employed; the cylinders are placed rectilineally end to end with a valve chamber between them. Steam is admitted alternately only to the contiguous ends of the cylinders; the respective piston rods working through the outer ends, are furnished with crossheads, which are united by means of external connecting rods, so that the pistons move simultaneously in the same direction, the inner face of one receiving high pressure steam, which is exhausted into the contiguous end of the other cylinder, wherein, upon the inner face of its piston, it acts expansively.

A steam engine cylinder combined with an hydraulic forcing apparatus for transmitting motive power is described. The engine works the force pump, and a water engine set in motion by the current created by the pump, works the machinery.

The invention, with regard to steam boilers and furnaces, is variously comprised under eleven different heads, which relate—

1st. To supplying air to furnaces between water tubes which form the furnace wall, instead of by means of an upward draught through the fire-bars.

2nd. In the case of brick furnaces, supplying the air through openings in the side walls, and causing the burning hot draughts to leave the furnace through similar but larger openings.

3rd. Causing a separation between the inflammable gases of newly fed coal, and the products of combustion from the incandescent fuel, in order that air may be separately supplied to the inflammable gases, for the purpose of promoting their combustion.

4th. Forming a central flue or fire way in furnaces to which air is admitted from both sides.

5th. Forming the walls of furnaces with double metal casing containing water space, such walls being removable without interfering with the working of the boiler when constructed in compartments according to a prior patent, granted to this inventor in the year 1859, No. 806.

6th. Applying one or more steam compartments to such boilers, for the purpose of surcharging the steam with heat either before or after use.

7th. By opening a damper in a direct flue, causing the products of combustion from a newly lighted fire to pass from the furnace to the chimney, without taking a circuitous course through the boiler flues.

8th. Feeding furnaces, which are formed of metal and have air admission channels in the sides, through an opening in the top, which is closed with a fire-brick cover; the level of the fuel being maintained above the air apertures.

9th. Employing a furnace of such a depth as to be capable of heating two or more boilers disposed above each other.

10th. Instead of at once creating a fire draught by the blast of exhaust steam, causing it to give motion to a turbine, which is to operate a fan, and thereby create the necessary draught.

11th. Employing waste steam to raise an accumulator, which is employed instead of, or in aid of the feed pumps.

[Printed, 10*d*. Drawing.]

A.D. 1863, October 6.—N° 2444.

BROOMAN, Richard Archibald.—(*A communication from Johann Christian Carsten Meyn.*)—This invention relates to the construction of a vertical steam boiler, which is cylindrical in form, and is fitted with a furnace containing two ranges of fire-bars, one range extending under the boiler to a central vertical flue, and the other range being contained in a portion of the furnace which is externally fitted to the lower part of the boiler,

and inclosed within walls of fire-brick or other refractory material, where through heating passages are formed for the currents of air which are admitted above the fuel to promote combustion. The flaming gases and fire draught pass from the furnace up the central flue into a cylindrical chamber, wherein vertically circumposed in close proximity is a number of corrugated fluted tubes, which form water communications between the upper and lower water spaces of the boiler. Around this circle of tubes is an annular flue space, into which, after impinging upon the flat tubes whilst passing radiatingly betwixt them, the flaming gases are received; thence they pass up numerous vertical tubes, set into the top of the flue, and forming upward passages for the fire draught through the upper water space into a flue casing, which surrounds and closes over the steam chamber, and supports the chimney funnel. Within this casing, disposed spirally in coils round the steam chamber, is a superheating tube, through which the steam passes on its way from the boiler to the engine. The sub air draught to that portion of the furnace which extends under the boiler is regulated by a flap valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, October 7.—N° 2458.

SLAUGHTER, Edward.—This invention relates to condensing the exhaust steam of locomotive engines while passing through tunnels or enclosed ways. "On the passage leading from the " steam cylinders into the chimney a cock or valve is applied, and " also a branch pipe leading to a surface condenser, in order that " the exhaust steam may be for a time shut off from the chimney, " and during such time turned into the surface condenser, which " is formed of tubes or narrow passages that are exposed to the " atmospheric air in order to admit of an extensive area of sur- " face being acted on by the atmospheric air as the locomotive " engine moves quickly along a railway. This condenser is " conveniently constructed of long tubular passages arranged in " a direction from the cylinder end of a locomotive engine to the " other end thereof, where an injection condenser and air pump, " such as are used in low-pressure engines, are situated. The " water tank is divided or is in two parts, and a connecting " pipe is applied to one of the parts in order to supply cold water " injection to the condenser whilst the water resulting from the

"condensed steam is pumped into the other or hot water com-
"partment of the water tank from which the boiler is supplied.
"The ash pan is also arranged, as has heretofore been done, so
"as to be closed when the exhaust steam is shut off from the
"chimney."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1863, October 8.—N° 2472.

NEWTON, ALFRED VINCENT.—(*A communication from William Judson.*)—The object of this invention, which relates to tubular condensers, is (1) to prevent the wearing and destructive action of the atmosphere and water upon the metal of the tubes, and to allow of their expansion and contraction without injury to the tube sheets or plates. The application of the principle admits of various modifications. In one arrangement vulcanized india-rubber packing rings or collars, which bed into recesses formed in the tube plate to receive them, are placed on one end of the tubes, and are squeezed into the recesses by means of annular nuts, which screw on to the tube ends, and so form steam or water-tight joints round the tubes, at the same time offering no impediment to expansion or contraction; the other ends of the tubes are fixed into the opposite tube plate in the usual way. Another method of securing an elastic attachment, is to fix by means of binding rings, one end of short lengths of vulcanized rubber tubes on to the corresponding end of the metal condenser tubes, and securing the other ends of the short rubber tubes in the corresponding holes of the tube plate by conical wedge rings. 2. Consists in reducing the diameter of one or both ends of the condenser tubes to allow of their being packed with the elastic packing, without necessitating a reduction in the number of tubes for a given measurement of tube surface. 3. Consists in the use of "vulcanite" for constructing the condenser tube-sheets or plates, which must be sufficiently thick to withstand the steam pressure, otherwise they may be supported by a perforated metal plate secured to the condenser shell, with vulcanized rubber packings interposed to admit of expansion.

[Printed, 10*d.* Drawing.]

A.D. 1863, October 9.—N° 2474.

WOOD, JAMES, WHITEHEAD, JOHN, and TETLOW, THOMAS.—This invention for governing the speed of steam

engines is applicable to engines furnished with governors of the ordinary construction, and consists in combining therewith an hydraulic cylinder and ram. From the top of the governor spindle a rod projects upwards, which is raised when the balls expand, and is correspondingly lowered when they collapse; the upper extremity of this rod is jointed to a lever which is mounted on a fixed stud; a connecting rod is jointed to the other end of the lever, and to the other end of this rod one end of the plunger lever is united, which at its other end carries the plunger rod of the hydraulic cylinder. The throttle or other valve rod connected to the valve for admitting steam to the engine, is operated by means of a rod attached by a sliding fulcrum to the plunger lever of the hydraulic cylinder, to which water or other fluid under pressure is supplied by a pipe in communication with the steam boiler or otherwise; this pipe has a tap or valve which is operated by the parts actuated by the governor. If when the apparatus is at work, the governor balls collapse by reason of a low rate of speed, water is admitted to the cylinder, the plunger is raised, and the throttle valve opened; the contrary action takes place when the speed of the engine is exceeding its normal rate.

[Printed, 10*d*. Drawing.]

A.D. 1863, October 12.—N° 2500.

FOX, Thomas.—This invention for cleaning out the tubes of steam boilers and other tubes, "consists of a tubular rod or handle "of any convenient length, having near to one end four or more "segmental plates or scrapers fixed to springs, which force them "outwards from the rod, so as to form a disc or plate of rather "larger diameter than the interior of the tube which it is in-"tended to clean out. Inside the tubular rod or handle is a "solid rod, which is connected at one end by a pin (working "through a slot in the tube) to a ring which embraces the springs "The other end of the inner rod is formed with a projection, "by means of which it can be moved longitudinally in the tube "in order to cause the ring to compress or release the springs, "so as to contract or expand the segmental scrapers.

"In using this apparatus it is placed in the tube in a con-"tracted form, the ring is then withdrawn from the springs, so "as to allow them to force the segmental scrapers outwards "against the inside of the tube, and the whole apparatus being

" drawn backwards and forwards will scrape or clean out the " tube or flue much more effectually than the wire brushes " hitherto employed for such purpose." The apparatus may be modified by the use of a spring for contracting the scrapers, and of a wedge connected to the interior of the sliding rod for causing the expansion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 14.—N° 2516.

INCHLEY, JOSEPH.—(*Provisional protection only.*)—This invention relates to the construction of valves for compound steam engine high and low pressure cylinders, whereby the steam is first directed into the high-pressure cylinder, thence into the low-pressure cylinder, and finally to the condenser or waste pipe. " The base of the valve consists of a thick circular disk, having " a series of radial openings communicating respectively with the " upper and lower ends of both cylinders, and with the condenser " or waste pipe. Upon this disk another disk fits, which last-" named disk is capable of a motion of partial rotation upon the " first-named fixed disk. A cap covering the moveable disk and " secured to the flange of the fixed disk makes with the fixed disk " the steam chest, into which steam from the boiler passes, and " within which the moveable disk works." The openings in the discs are suitably arranged according to the position into which they are respectively brought in relation to each other and to the steam inlet and exhaust ports of the high and low pressure cylinders. Motion may be given to the movable portion of the valve by an excentric on the engine shaft or otherwise. When applied to oscillating cylinders, the openings and channels in the valves require slight modification.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 14.—N° 2517.

COLQUHOUN, EWING PYE, and FERRIS, JOHN PARDOE.—This invention relates to fire-bars for the furnaces of steam boilers, and to the manner in which they are mounted. These fire-bars are so arranged upon movable bearers, that a variety of movements, by means of levers or otherwise, can be imparted to them. These movements may be intermittent when effected by hand, or continuous when operated by mechanism actuated by

the engine power. The upper surface of each bar, with a view to give additional strength where required, is considerably curved. The two bearing bars, which support and impart motion to the fire-bars, are transversely disposed in a horizontal position, on bearings fitted respectively on each side, about the mid-length of the furnace, to the side plates or walls. A projection on the under side of each fire-bar fits loosely into one of a series of snugs or recesses formed at intervals along the top of each bearing bar, so that one of the latter supports every alternate fire-bar, and and the other those fire-bars which are intermediate. By these means when motion, either separately or conjointly, is given to the bearing bars, the corresponding effect is imparted to the fire-bars. In some cases arrangements are made to effect the lowering and raising of the brackets which support the bearing bars, whereby the whole fire-bar range may be depressed, so as to enable the attendant to remove the fire without disturbing the bars.

[Printed, 10*d*. Drawing.]

A.D. 1863, October 16.—N° 2532.

ROWING, Esau.—(*Provisional protection only.*)—This invention relates to steam engines and boilers. Instead of an ordinary slide valve, a double piston valve is employed, the steam being admitted between the pistons and into the inlet ports of the cylinders as the pistons in succession by a limited action alternately uncover them. The main cylinder is made unusually long in order to accommodate a hollow cylindrical piston which occupies nearly one-half the length. The exhaust port is situated about mid-length in the cylinder side, and is uncovered alternately by each end of the piston towards the termination of the stroke in either direction, the piston thereby acting as the exhaust valve. The boiler consists of two longitudinal tubes, disposed a convenient distance apart on the same horizontal plane, and connected together by a series of transverse tubes; a number of small tubes, provided or furnished with inner tubes to separate the steam and water currents, project downwards from each of the main tubes at intervals along their whole length; these vertical tubes are enclosed by the sides of the furnace and the flue walls, and the whole arrangement is covered in above the transverse tubes, which are exposed to the fire heat; chambers for heating air are constructed outside the flue passages; the air current is admitted

through these chambers and passes thence in a heated state into a closed ash-pit beneath the fire-bars. A feed water tank is superposed upon the boiler; into this tank above the surface of the water contained, the exhaust steam is blown, whereby the feed water is heated before being supplied to the boiler. The working parts of the engine are fixed on the top of the tank.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 16.—N° 2533.

BROOMAN, Richard Archibald. — (*A communication from Guillaume Samuel Dobbs.*)—(*Provisional protection only.*)—This invention relates to the construction of steam pumps which severally consist of a vessel divided by a flexible diaphragm into two compartments. Opening into one compartment there is an orifice for the admission and emission of steam and into the other campartment an opening is provided for the influx and reflux of the water or fluid. The steam being admitted by means of a rotary slide behind the diaphragm "forces it in contact with the " further side of the vessel; the slide then allows of the discharge " and condensation of the steam, and the diaphragm is drawn " back towards that side of the vessel opposite to which it had " been driven; the vacuum thus produced behind the diaphragm " causes the inflow of the fluid into the vessel at the back of the " diaphragm. Inlet and outlet valves are fitted to the pipe for " the admission and exit of the fluid. On steam being again " admitted in front of the diaphragm the fluid will be driven " out from behind it, and so on. The diaphragm constitutes a " kind of piston, and the greater the non-conducting powers of " the material of which it is composed, less will be the conden- " sation in the pump itself, and hence greater economy."

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 17.—N° 2542.

CLARK, William.—(*A communication from George Bradford Mac Farland.*)—(*Provisional protection only.*)—This invention relates to rotary engines capable of working with or without expansion, with single or double action, and fitted with reversing gear. The apparatus consists of a cylindrical chamber transversely divided into two parts, each part containing an annular boss or disc. These bosses are fixed on the main axis, and each carries

(projecting from its periphery) a pallet or piston, which divides in each compartment an annular space, formed between the inside of the cylinder and the central bosses; each division is furnished with a radial slide, to which by means of tappet cams and levers, a to-and-forth motion is given, in order as the piston in each division arrives at that point in its rotation, the radial slides in each shall be respectively withdrawn in time to allow the pistons to pass, and be immediately shot in again to form fixed resisting abutments for the steam, which by means of suitable valves is admitted between the pistons and the slides the moment the latter have recrossed the steam spaces. The force of the steam drives the pistons and the bosses round, and so rotates the shaft, the action being kept up alternately in each division of the cylinder; the inlet and exhaust ports are situated respectively on the fore and after sides of the radial slides.

[Printed, 1*s*. Drawings.]

A.D. 1863, October 17.—Nº 2549.

MONCKTON, Edward Henry Cradock.—This invention relates to a process for uniting or joining, otherwise than by rivetting, plates or sheets of metal, applicable to the construction of boilers and tubes, and to other purposes.

It consists 1st. In the method employed for generating and applying heat to the metal under operation. This is effected by a variety of contrivances for commingling air with inflammable gas mechanically, and burning the compound fluid in suitable furnaces, lined or not with fire-brick or otherwise, the gaseous mixture being conveyed from the commixing vessel, and brought into the furnace, by means of tubes fitted with regulating cocks. The heat generated by the combustion of the compound fluid is used for brazing, soldering, heating, welding, smelting, and for similar purposes.

2nd. Relates to the various fluxes employed in the process, of which the components of four are described.

3rd. To the manner in which the process of uniting and joining the metal is effected by brazing and soldering, so that plates, suitable for constructing steam boilers and ships, tubes capable of sustaining immense pressure, suitable for hydraulic presses, cannon, and guns, may be so united by the process as to effect a junction superior in strength to rivetting, or any other method

heretofore practised. The details of the process are elaborately explained and described in a series of paragraphs numbering 1 to 18.

[Printed, 6*d*. No Drawings.]

A.D. 1863, October 20.—N° 2566.

SNELL, William.—(*A communication from George Wagstaff Yapp.*)—This invention relates to surface condensers, and consists in increasing the extent of cooling surface within a given space by packing in the condenser tubes cases or vessels, diaphragms of wire gauze, wire in bundles, iron turnings, shot or other metallic particles, in order that the steam which passes through the tubes or vessels, may be condensed by contact with the multifarious metal surfaces within them. The condensing apparatus consists of a case made of boiler plate, closed with flat top and sides and convex bottom; it is disposed in a sloping position in order that the water of condensation may drain out of the tubes with which it is longitudinally filled, intervening space being left between the tubes for the interflowing of the condensing water, for the passage of which to and from the apparatus, suitable pipes are attached thereto. An air vessel for relieving the apparatus when starting the engine, is provided, and also the means of clearing out sedimentary deposits. For feeding the boiler with the water produced by condensation, a double cylinder pump is employed which also pumps the air out of the cistern. The form of the case and manner of disposing the tubes may be varied, and when used on ship-board, by means of an indicator the speed of the flow of water through the apparatus is exhibited to the engineer. These condensing tubes or vessels filled with metallic particles in the manner described, are according to the invention applicable to purposes otherwise than the condensation of steam. Modifications are described.

[Printed 1*s*. 4*d*. Drawings.]

A.D. 1863, October 21.—N° 2581.

SCHIELE, Christian.—This invention, which relates to apparatus for governing the speed of turbines, is also applicable as a governor for steam and other engines, and more particularly under circumstances where considerable force is required to move the valve or the clow, which regulates the admission of the motive fluid.

It consists 1st, in arranging an elastic drum, or apparatus acting upon the principle of a pair of smith's bellows, as described by the inventor in the specification of a former patent, which bears date July 7, 1863, No. 1681, and comprises "a cover and cylin-" der, or a piston and cylinder, capable of receiving motion by " the admission or withdrawal of the motive fluid." Another governor, apart from the turbine, is also described, the vertical shaft, ball governor, drum, cover and valves, being arranged to rotate in a vessel containing water.

2nd, relates to another mode of acting on elastic drums, or drums and covers, or piston and cylinders, by currents of fluid, a continuous leakage or outflow being arranged to produce a movement in one direction, and a supply, made variable by a valve operated by a governor, is arranged to produce a movement in the opposite direction.

3rd, relates to means for regulating the consumption of water in turbines in relation to the supply, a uniform height of fall being maintained, and the turbine working in conjunction with a steam engine.

4th, relates to means for regulating the speed or load of the turbine, in order to suit any irregular head or fall of water.

[Printed, 1*s*. Drawing.]

A.D. 1863, October 21.—Nº 2588.

COLBURN, Zerah.—This invention "relates to that class of " steam engines in which the opposite working faces of the piston " present unequal areas for the effective pressure of steam, and " in which a pressure of steam is continuously maintained upon " that side of the piston having the smaller effective area, while " steam is admitted periodically upon the opposite or larger side or " working face of the piston, the steam thus periodically admitted " being afterwards exhausted at each double stroke of the piston " either into the atmosphere or into a condenser, feed water " heater, or wherever else required." The object of the present invention is to simplify such engines and adapt them to sawing, pumping, and other purposes requiring no rotary motion, or to such as possess it only to determine the length and change the direction of the strokes; in the latter case the shaft, crank, connecting rod, and the steam valve and apparatus for working it, are placed directly within that part or end of the steam cylinder

or case in which the pressure of steam is continually maintained and constantly pressing upon the smaller effective area of the piston. The shaft passes through one or both sides of the cylinder in stuffing box bearings; the fly wheel is mounted on the end of the shaft outside the cylinder. An engine of this class is wholly self-contained and very portable; the working parts are inside the cylinder or enclosed in the casting between the two pistons which work in cylindrical chambers at the ends on one piston rod. When no rotary motion at all is required, the valves are worked by tappets attached between the pistons to the piston rod. The valve may be an ordinary slide, or in the form of a ring sliding between the pistons within the cylinder. The Specification of prior Letters Patent granted to this inventor bearing date July 29th 1862, No. 2145, is referred to, and also a variety of Letters Patent granted to other inventors, relating to the same class of subject matter; many modifications are described and exhibited in the drawings, the object sought in most cases being economy and simplicity in the manner and cost of production rather than economy in the use of the steam.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1863, October 22.—N° 2592.

CUTLER, George, junior.—This invention relates to steam boilers and generators, the forms of which are cylindrical, and of the vertical class, with hemispherical tops, and supported on cast-iron leg frames. The interior of such a boiler constructed for heating with gas is furnished with a series of horizontal flue chambers, which by means of short tubular connections through the water spaces, communicate with the bottom chamber and with the others in succession to the top chamber, and thence through bent tubes, the flaming and other products of the combustion of the gas, pass upwards over the dome top within a flue casing which opens above to the chimney, wherein a damper is placed which can be operated by a handle outside; the top of the boiler is encircled by a water tank, and the lower part is enclosed by a casing filled with fire-clay; gas is admitted under the boiler through a series of vertical pipes which have flanged open tops, so covered with plates as to leave a very thin opening all round between the flanges and plates for the passage of the gas, which

and levers are required. The end of the piston rod of the large cylinder is fashioned to constitute the tool holder, so that as the rod works to and forth, the tools operate on the mineral by direct action. In addition to the usual means of turning the boring instrument, a simultaneous feed motion is imparted thereto. This feed motion is effected by connecting the feed screw to the spindle which is inserted through the end of the cylinder for the purpose of turning the tool; a ratchet wheel is fixed on the screw, and an excentric on the spindle, whereby a lever, to which the ratchet pawl is jointed, is set in motion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 26.—N° 2640.

HEALEY, Samuel James.—(*Provisional protection only.*)—This invention relating to water gauges applicable to steam boilers and other purposes "consists in improved modes of keeping the "tubes tight in their sockets, and allowing them free expansion. "Instead of pressing the tubes at the sides by packing, I cause "them to be pressed at their ends, so that great force may be "exerted upon them without fracture. The ends of the tube "are placed in sockets provided with india-rubber washers, "cement, or other material for making the joint, and to one of "the sockets is connected a double diaphragm consisting of two "plates of metal brazed or soldered together at their edges, so as "to form an expanding or contracting cavity. One of the plates "is connected to the socket communicating with the boiler or "other vessel, and each plate has a hole for leading to the interior "of the glass tube and to the interior of the double diaphragm, "into which the steam or other agent enters and expands it "according to the pressure, which thereby exerts a corres- "ponding pressure upon the ends of the tube and maintains it "perfectly tight, and when desired a spiral spring may be intro- "duced between the plates of the double diaphragm to assist the "pressure." Other modes for holding the tube are also in some cases employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 28.—N° 2667.

NEEDHAM, Richard, and POLLITT, James.—(*Provisional protection only.*)—This invention of equilibrium valves for steam engine and other purposes "consists in employing a valve and

"piston on one rod instead of the double valve as at present. "The valve seating is made to correspond with the valve, and "the piston works in a ring or cylinder, so that when steam or "other agent is admitted between the valve and the piston, the "equilibrium of the two will be in proportion to the areas of their "respective surfaces. By this arrangement the valve works with "great steadiness, and is certain of being tight, for whatever "may be the expansion or contraction of the parts the piston "will rise or fall in the ring or cylinder and accomodate the "valve." In some cases the piston is made stationary in a ring or cylinder in the shell of the valve, which causes the valve to remain tight whatever be the contraction or expansion of the valve and seating.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—N° 2683.

COCHRANE, HENRY.—This invention relates to surface condensers, and is also applicable to the refrigeration or cooling of liquids. It consists in the use of two pipes or vessels of similar configuration, but of such differing size that one is sufficiently large to admit the other inside it and leave a thin space of uniform breadth all round between the two vessels: this annular or otherwise formed space is closed at the top and bottom and made perfectly air tight: the exhaust steam from the engine enters the space at the top of the apparatus, and the water of condensation flows out through a suitable pipe at the bottom. Narrow troughs constantly kept filled with cold condensing water are fitted at the top of the apparatus, one round the exterior and the other round the interior, in such a manner that narrow apertures are left round the bottom of each trough close to the external and internal surface of the apparatus; through these apertures the water flows out of the trough bottoms and trickles down the surfaces in thin films or streams, so that the steam within is surrounded by the falling water, separated only by the thin metal of the apparatus, which is supported upon standards or framing in order that a free upward air current may be ensured through the interior, the draught through which may be strengthened by placing the apparatus in connection with a fire, or by the aid of a fan. The apparatus may be surrounded by a casing of sufficient size to form an external air draught

and levers are required. The end of the piston rod of the large cylinder is fashioned to constitute the tool holder, so that as the rod works to and forth, the tools operate on the mineral by direct action. In addition to the usual means of turning the boring instrument, a simultaneous feed motion is imparted thereto. This feed motion is effected by connecting the feed screw to the spindle which is inserted through the end of the cylinder for the purpose of turning the tool; a ratchet wheel is fixed on the screw, and an excentric on the spindle, whereby a lever, to which the ratchet pawl is jointed, is set in motion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 26.—N° 2640.

HEALEY, Samuel James.—(*Provisional protection only.*)—This invention relating to water gauges applicable to steam boilers and other purposes "consists in improved modes of keeping the "tubes tight in their sockets, and allowing them free expansion. "Instead of pressing the tubes at the sides by packing, I cause "them to be pressed at their ends, so that great force may be "exerted upon them without fracture. The ends of the tube "are placed in sockets provided with india-rubber washers, "cement, or other material for making the joint, and to one of "the sockets is connected a double diaphragm consisting of two "plates of metal brazed or soldered together at their edges, so as "to form an expanding or contracting cavity. One of the plates "is connected to the socket communicating with the boiler or "other vessel, and each plate has a hole for leading to the interior "of the glass tube and to the interior of the double diaphragm, "into which the steam or other agent enters and expands it "according to the pressure, which thereby exerts a corres- "ponding pressure upon the ends of the tube and maintains it "perfectly tight, and when desired a spiral spring may be intro- "duced between the plates of the double diaphragm to assist the "pressure." Other modes for holding the tube are also in some cases employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 28.—N° 2667.

NEEDHAM, Richard, and POLLITT, James.—(*Provisional protection only.*)—This invention of equilibrium valves for steam engine and other purposes "consists in employing a valve and

" piston on one rod instead of the double valve as at present. " The valve seating is made to correspond with the valve, and " the piston works in a ring or cylinder, so that when steam or " other agent is admitted between the valve and the piston, the " equilibrium of the two will be in proportion to the areas of their " respective surfaces. By this arrangement the valve works with " great steadiness, and is certain of being tight, for whatever " may be the expansion or contraction of the parts the piston " will rise or fall in the ring or cylinder and accomodate the " valve." In some cases the piston is made stationary in a ring or cylinder in the shell of the valve, which causes the valve to remain tight whatever be the contraction or expansion of the valve and seating.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—N° 2683.

COCHRANE, HENRY.—This invention relates to surface condensers, and is also applicable to the refrigeration or cooling of liquids. It consists in the use of two pipes or vessels of similar configuration, but of such differing size that one is sufficiently large to admit the other inside it and leave a thin space of uniform breadth all round between the two vessels: this annular or otherwise formed space is closed at the top and bottom and made perfectly air tight: the exhaust steam from the engine enters the space at the top of the apparatus, and the water of condensation flows out through a suitable pipe at the bottom. Narrow troughs constantly kept filled with cold condensing water are fitted at the top of the apparatus, one round the exterior and the other round the interior, in such a manner that narrow apertures are left round the bottom of each trough close to the external and internal surface of the apparatus; through these apertures the water flows out of the trough bottoms and trickles down the surfaces in thin films or streams, so that the steam within is surrounded by the falling water, separated only by the thin metal of the apparatus, which is supported upon standards or framing in order that a free upward air current may be ensured through the interior, the draught through which may be strengthened by placing the apparatus in connection with a fire, or by the aid of a fan. The apparatus may be surrounded by a casing of sufficient size to form an external air draught

and levers are required. The end of the piston rod of the large cylinder is fashioned to constitute the tool holder, so that as the rod works to and forth, the tools operate on the mineral by direct action. In addition to the usual means of turning the boring instrument, a simultaneous feed motion is imparted thereto. This feed motion is effected by connecting the feed screw to the spindle which is inserted through the end of the cylinder for the purpose of turning the tool; a ratchet wheel is fixed on the screw, and an excentric on the spindle, whereby a lever, to which the ratchet pawl is jointed, is set in motion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 26.—N° 2640.

HEALEY, SAMUEL JAMES.—(*Provisional protection only.*)—This invention relating to water gauges applicable to steam boilers and other purposes "consists in improved modes of keeping the "tubes tight in their sockets, and allowing them free expansion. "Instead of pressing the tubes at the sides by packing, I cause "them to be pressed at their ends, so that great force may be "exerted upon them without fracture. The ends of the tube "are placed in sockets provided with india-rubber washers, "cement, or other material for making the joint, and to one of "the sockets is connected a double diaphragm consisting of two "plates of metal brazed or soldered together at their edges, so as "to form an expanding or contracting cavity. One of the plates "is connected to the socket communicating with the boiler or "other vessel, and each plate has a hole for leading to the interior "of the glass tube and to the interior of the double diaphragm, "into which the steam or other agent enters and expands it "according to the pressure, which thereby exerts a corres-"ponding pressure upon the ends of the tube and maintains it "perfectly tight, and when desired a spiral spring may be intro-"duced between the plates of the double diaphragm to assist the "pressure." Other modes for holding the tube are also in some cases employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 28.—N° 2667.

NEEDHAM, RICHARD, and POLLITT, JAMES.—(*Provisional protection only.*)—This invention of equilibrium valves for steam engine and other purposes "consists in employing a valve and

" piston on one rod instead of the double valve as at present. " The valve seating is made to correspond with the valve, and " the piston works in a ring or cylinder, so that when steam or " other agent is admitted between the valve and the piston, the " equilibrium of the two will be in proportion to the areas of their " respective surfaces. By this arrangement the valve works with " great steadiness, and is certain of being tight, for whatever " may be the expansion or contraction of the parts the piston " will rise or fall in the ring or cylinder and accomodate the " valve." In some cases the piston is made stationary in a ring or cylinder in the shell of the valve, which causes the valve to remain tight whatever be the contraction or expansion of the valve and seating.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—N° 2683.

COCHRANE, HENRY.—This invention relates to surface condensers, and is also applicable to the refrigeration or cooling of liquids. It consists in the use of two pipes or vessels of similar configuration, but of such differing size that one is sufficiently large to admit the other inside it and leave a thin space of uniform breadth all round between the two vessels: this annular or otherwise formed space is closed at the top and bottom and made perfectly air tight: the exhaust steam from the engine enters the space at the top of the apparatus, and the water of condensation flows out through a suitable pipe at the bottom. Narrow troughs constantly kept filled with cold condensing water are fitted at the top of the apparatus, one round the exterior and the other round the interior, in such a manner that narrow apertures are left round the bottom of each trough close to the external and internal surface of the apparatus; through these apertures the water flows out of the trough bottoms and trickles down the surfaces in thin films or streams, so that the steam within is surrounded by the falling water, separated only by the thin metal of the apparatus, which is supported upon standards or framing in order that a free upward air current may be ensured through the interior, the draught through which may be strengthened by placing the apparatus in connection with a fire, or by the aid of a fan. The apparatus may be surrounded by a casing of sufficient size to form an external air drau

and levers are required. The end of the piston rod of the large cylinder is fashioned to constitute the tool holder, so that as the rod works to and forth, the tools operate on the mineral by direct action. In addition to the usual means of turning the boring instrument, a simultaneous feed motion is imparted thereto. This feed motion is effected by connecting the feed screw to the spindle which is inserted through the end of the cylinder for the purpose of turning the tool; a ratchet wheel is fixed on the screw, and an excentric on the spindle, whereby a lever, to which the ratchet pawl is jointed, is set in motion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 26.—N° 2640.

HEALEY, SAMUEL JAMES.—(*Provisional protection only.*)—This invention relating to water gauges applicable to steam boilers and other purposes " consists in improved modes of keeping the " tubes tight in their sockets, and allowing them free expansion. " Instead of pressing the tubes at the sides by packing, I cause " them to be pressed at their ends, so that great force may be " exerted upon them without fracture. The ends of the tube " are placed in sockets provided with india-rubber washers, " cement, or other material for making the joint, and to one of " the sockets is connected a double diaphragm consisting of two " plates of metal brazed or soldered together at their edges, so as " to form an expanding or contracting cavity. One of the plates " is connected to the socket communicating with the boiler or " other vessel, and each plate has a hole for leading to the interior " of the glass tube and to the interior of the double diaphragm, " into which the steam or other agent enters and expands it " according to the pressure, which thereby exerts a corres- " ponding pressure upon the ends of the tube and maintains it " perfectly tight, and when desired a spiral spring may be intro- " duced between the plates of the double diaphragm to assist the " pressure." Other modes for holding the tube are also in some cases employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 28.—N° 2667.

NEEDHAM, RICHARD, and POLLITT, JAMES.—(*Provisional protection only.*)—This invention of equilibrium valves for steam engine and other purposes " consists in employing a valve and

" piston on one rod instead of the double valve as at present. " The valve seating is made to correspond with the valve, and " the piston works in a ring or cylinder, so that when steam or " other agent is admitted between the valve and the piston, the " equilibrium of the two will be in proportion to the areas of their " respective surfaces. By this arrangement the valve works with " great steadiness, and is certain of being tight, for whatever " may be the expansion or contraction of the parts the piston " will rise or fall in the ring or cylinder and accomodate the " valve." In some cases the piston is made stationary in a ring or cylinder in the shell of the valve, which causes the valve to remain tight whatever be the contraction or expansion of the valve and seating.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—N° 2683.

COCHRANE, HENRY.—This invention relates to surface condensers, and is also applicable to the refrigeration or cooling of liquids. It consists in the use of two pipes or vessels of similar configuration, but of such differing size that one is sufficiently large to admit the other inside it and leave a thin space of uniform breadth all round between the two vessels: this annular or otherwise formed space is closed at the top and bottom and made perfectly air tight: the exhaust steam from the engine enters the space at the top of the apparatus, and the water of condensation flows out through a suitable pipe at the bottom. Narrow troughs constantly kept filled with cold condensing water are fitted at the top of the apparatus, one round the exterior and the other round the interior, in such a manner that narrow apertures are left round the bottom of each trough close to the external and internal surface of the apparatus; through these apertures the water flows out of the trough bottoms and trickles down the surfaces in thin films or streams, so that the steam within is surrounded by the falling water, separated only by the thin metal of the apparatus, which is supported upon standards or framing in order that a free upward air current may be ensured through the interior, the draught through which may be strengthened by placing the apparatus in connection with a fire, or by the aid of a fan. The apparatus may be surrounded by a casing of sufficient size to form an external air draugh'

escapes therethrough and burns in a thin flame round the edge, air being admitted at the base of each vertical pipe to mingle with the gas, thereby increasing the heat and insuring perfect combustion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 22.—N° 2594.

WILSON, HENRY.—(*Provisional protection only.*)—This invention consists of a lubricator for steam engines so constructed that oil, tallow or other fatty matter may be used, and applied continuously. The bottom end of a hollow tapering brass plug with three or more lateral openings, is either screwed into the steam pipe, or fixed contiguously convenient for connecting to the engine cylinders or boiler. A conical cylinder contains the plug; this cylinder is furnished with similar lateral openings, but so arranged that only one of the openings in the plug and one in the cylinder can be brought into coincidence at the same time: the whole is enclosed in a suitable glass or metal case with an open cup or funnel superposed, into which the lubricant is poured. The apparatus is furnished with an index marked " feed " " open " and " blow through " as well as a handle and pointer; also a small cock is fixed to an outer vessel communicating by means of two tubes with the top and bottom of the lubricator; it is provided with an index marked " grease," and " water." When required to be replenished, the pointer is to be turned to " feed " and the small cock to " grease;" the lubricant is then poured in until it shows out of the small cock which must then be immediately shut. The pointer is then turned to " open " which opens a communication admitting steam to the lubricator, and causes a portion of the lubricant to be forced into the cylinder through the corresponding opening in the tapering plug. The whole contents of the lubricator may be discharged by turning the pointer to " blow through." The apparatus may be freed from " water " by turning the small cock to that point.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 23.—N° 2620.

PARKER, JAMES.—This invention relates to the application of steam combined with air, as a motive power, and for other purposes. The inventor says " I obtain motive power from steam

"generated in a boiler combined with atmospheric air in larger or "smaller quantities, according to the pressure required, by discharging the steam in small jets, each of which is opposite to a "pipe or air nozzle which receives the steam jet after it has passed "through the air between the point of issue of the jet and its "entry into the air nozzle. The air nozzles communicate with a "receiver in connection with the valves of the cylinder, or directly "with the valves of the cylinder, as in an ordinary steam engine. "The steam jet in passing through the air into the open end of "the air nozzle draws with it atmospheric air which thus becomes "heated and increased in bulk or pressure. I prefer to place the "air nozzle at such a distance from the aperture from which the "steam jet issues as is equal to its diameter, that is to say, if an "air nozzle of half an inch diameter be used it should be placed "half an inch distant from the aperture."

The steam and air may be used in an ordinary non-condensing steam engine, when working under rather high pressure, or in a cylinder or vessel with flexible sides, when the compound motive agent is used at a low pressure, and when it is charged with an undue proportion of air. The cylinder, with flexible sides of india-rubber or other suitable material, may be constructed upon the same principle as double-action bellows, with a movable diaphragm which acts as a piston. Another apparatus, as adapted for applying the compound fluid, is described. After being used as a motive power, the fluid compound may either be discharged within the furnace or into the ash-pit. It is found that an underdraught is not necessary, and that if the discharge blast from the engine be directed into the furnace, the fire may be maintained at a bright heat by the distribution of the steam and air over the surface of the burning fuel.

[Printed, 4d. No Drawings.]

A.D. 1863, October 24.—N° 2624.

CREASE, Edward Smith.—This invention relates to steam machinery for drilling, boring, or excavating rock, or other minerals and earthy substances.

With regard to the steam engine employed in conjunction with the excavating apparatus. Two steam cylinders are disposed side by side, one of lesser diameter than the other. The pistons, and the steam passages communicating between the two cylinders, are so arranged, that each piston acts as a piston valve to the other, consequently none of the ordinary arrangements of valves

and levers are required. The end of the piston rod of the large cylinder is fashioned to constitute the tool holder, so that as the rod works to and forth, the tools operate on the mineral by direct action. In addition to the usual means of turning the boring instrument, a simultaneous feed motion is imparted thereto. This feed motion is effected by connecting the feed screw to the spindle which is inserted through the end of the cylinder for the purpose of turning the tool; a ratchet wheel is fixed on the screw, and an excentric on the spindle, whereby a lever, to which the ratchet pawl is jointed, is set in motion.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 26.—N° 2640.

HEALEY, Samuel James.—(*Provisional protection only.*)—This invention relating to water gauges applicable to steam boilers and other purposes "consists in improved modes of keeping the "tubes tight in their sockets, and allowing them free expansion. "Instead of pressing the tubes at the sides by packing, I cause "them to be pressed at their ends, so that great force may be "exerted upon them without fracture. The ends of the tube "are placed in sockets provided with india-rubber washers, "cement, or other material for making the joint, and to one of "the sockets is connected a double diaphragm consisting of two "plates of metal brazed or soldered together at their edges, so as "to form an expanding or contracting cavity. One of the plates "is connected to the socket communicating with the boiler or "other vessel, and each plate has a hole for leading to the interior "of the glass tube and to the interior of the double diaphragm, "into which the steam or other agent enters and expands it "according to the pressure, which thereby exerts a corres-"ponding pressure upon the ends of the tube and maintains it "perfectly tight, and when desired a spiral spring may be intro-"duced between the plates of the double diaphragm to assist the "pressure." Other modes for holding the tube are also in some cases employed.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 28.—N° 2667.

NEEDHAM, Richard, and POLLITT, James.—(*Provisional protection only.*)—This invention of equilibrium valves for steam engine and other purposes "consists in employing a valve and

" piston on one rod instead of the double valve as at present. " The valve seating is made to correspond with the valve, and " the piston works in a ring or cylinder, so that when steam or " other agent is admitted between the valve and the piston, the " equilibrium of the two will be in proportion to the areas of their " respective surfaces. By this arrangement the valve works with " great steadiness, and is certain of being tight, for whatever " may be the expansion or contraction of the parts the piston " will rise or fall in the ring or cylinder and accomodate the " valve." In some cases the piston is made stationary in a ring or cylinder in the shell of the valve, which causes the valve to remain tight whatever be the contraction or expansion of the valve and seating.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 30.—Nº 2683.

COCHRANE, HENRY.—This invention relates to surface condensers, and is also applicable to the refrigeration or cooling of liquids. It consists in the use of two pipes or vessels of similar configuration, but of such differing size that one is sufficiently large to admit the other inside it and leave a thin space of uniform breadth all round between the two vessels: this annular or otherwise formed space is closed at the top and bottom and made perfectly air tight: the exhaust steam from the engine enters the space at the top of the apparatus, and the water of condensation flows out through a suitable pipe at the bottom. Narrow troughs constantly kept filled with cold condensing water are fitted at the top of the apparatus, one round the exterior and the other round the interior, in such a manner that narrow apertures are left round the bottom of each trough close to the external and internal surface of the apparatus; through these apertures the water flows out of the trough bottoms and trickles down the surfaces in thin films or streams, so that the steam within is surrounded by the falling water, separated only by the thin metal of the apparatus, which is supported upon standards or framing in order that a free upward air current may be ensured through the interior, the draught through which may be strengthened by placing the apparatus in connection with a fire, or by the aid of a fan. The apparatus may be surrounded by a casing of sufficient size to form an external air draught

passage. Altogether the condenser stands a considerable height, and is large in diameter. The condensing surfaces may be increased by the use of corrugated metal plates in its construction. When used for cooling or refrigerating purposes, the hot liquids take the course of the steam. Modifications of the invention are illustrated and described.

[Printed, 2s. Drawings.]

A.D. 1863, October 30.—N° 2692.

VERRAN, William.—This invention relates to "machinery for "obtaining motive power by means of steam." A wheel mounted on an axis is furnished round its periphery with projecting blades or paddles, or chambers. The wheel is enclosed by a fixed hollow circular ring or cylinder, the internal surface of which is furnished with jet holes or apertures opening out from the internal chamber at a suitable angle to the radius of the wheel. Steam is admitted into the chambered hollow within the encircling ring cylinder, and issues with impulsive force from the apertures in strong jets inclined in a suitable direction for striking the blades paddles or chambers formed on the periphery of the wheel, which is thereby set in motion, rotation being kept up by the continuous force of the jets of steam. The wheel axle revolves in suitable supporting bearings, and is fitted with gearing for driving machinery. The principle of the apparatus may be modified by introducing the steam through the axis and arms of the wheel, and cause it to issue from the periphery in jets directed at a suitable angle against fixed blades or chambers disposed around it.

[Printed, 10d. Drawing.]

A.D. 1863, October 31.—N° 2707.

HOLMAN, Stephen. — This invention of apparatus for raising and forcing fluids, is in part applicable to steam engines, blast engines, exhausters, and other machines. It consists :—

1st. "Of a double open-ended cylinder made in a continuous "line with a shifting or oscillating double-beat valve working in "a chamber formed midway of the double cylinder; two pistons "are secured to one piston rod, which rod passes through the "chamber and also through the oscillating double-beat valve. "*The* piston may be actuated by any ordinary method of "*producing* reciprocating motion. The oscillating valve which

" works in the chamber between the two pistons is a delivery " valve only, but is common to both pistons, and is operated " upon by each at the same time, being drawn by one and forced " by the other. The double cylinder or double barrel (as more " generally expressed for pumps) may be made in one or more " pieces, and to make it more readily understood I will consider " it as two cylinders, viz., one cylinder on each side of the " delivery valve chamber, which delivery valve serves for both " pistons. Openings are formed in the cylinders in close " proximity to the central delivery valve chamber for the " admission of water or other fluid to follow the course of " the piston," to which motion is simultaneously communicated.

2nd. A novel arrangement of pump valves and passages, whereby a pump of large working capacity is cheaply constructed.

3rd. Relates to a ready method of securing two pistons on one piston rod simultaneously.

4th. Relates to the adaptation of the oscillating double-beat valve, to steam and other engines and machines; the arrangement of cylinder, piston, and central valve, is similar to the first arrangement described, the difference being that when used as a pump, the pistons are driven by other power, and when as a motive power engine, the pistons transmit the power of the motive agent employed.

[Printed, 1s. Drawing.]

A.D. 1863, November 2.—N° 2710.

VANDENVINNE, Florent Joseph.—This is an invention of steam machinery for excavating land and making cuttings for railways, roads, canals, and similar works. " For this purpose a " framework mounted on wheels and running on rails or on a " tramway is employed; this carries a small steam engine of " sufficient horse power to work the apparatus. On the front " part of the frame or carriage are placed two vertical shafts in " wrought iron, working in bearings bolted to the frame; these " shafts are furnished with a number of arms carrying picks with " steel points; they are fitted and wedged to the shafts, and the " picks are placed on the shaft so as to form the blades of the " helix or screw, so that only the points of one set of picks of

" each shaft touch at the same time the earth to be removed, and
" the sets of picks succeed each other without interruption.
" These shafts work in opposite directions, so that the picks
" cross one another continuously, and the arms on the upper
" ends of the shafts are longer than at the lower ends, so that
" they make in working a sloping cutting. The shafts with the
" picks are actuated by gearing and driving belts from the engine.
" This apparatus cuts and detaches the earth and throws it into
" buckets fixed on an endless chain; the buckets take the earth
" up to the top of the frame and empty it down an inclined plane
" into waggons for removal; these waggons may be placed
" either on the right side or left, or behind the frame as most
" convenient. The frame is worked forward by a shaft fitted
" with a screw working with a worm wheel on the axles of the
" carrying wheels; the whole apparatus is thus moved forward
" so as to keep the picks continually in contact with the earth."

[Printed, 10*d*. Drawing.]

A.D. 1863, November 3.—N° 2715.

DAVY, DAVID, junr.—This invention relates to the valvular apparatus of steam hammers, whereby their working is rendered more free, their motions more easily regulated, and their action effected without jerk or concussion. The main cylinder valve is attached to and actuated by a piston valve contained in a small auxiliary steam cylinder; the apparatus is so arranged that the valve of the main cylinder always travels one uniform distance whether the strokes of the hammer be long or short, so that the latter rests after each stroke, whereby ample time is provided for the ingress and escape of steam, and the full effect of the blow ensured. For regulating the length of stroke, the valve of the auxiliary cylinder is provided with adjustable back plates, which permit the ports to open sooner or later, and so regulate the movements of the piston in the auxiliary cylinder and with it the main cylinder valve. The back plates have considerable lap at opposite ends, and hollow channels cut in them for the passage of the exhaust steam; as soon as the steam is cut off at the upper end, it opens to the exhaust, but it is not admitted to the other end of the auxiliary cylinder until the valve port passes from under the lower end of one of the back plates, which like the upper end of the other plate has little or no lap. By moving

the back plates so as to closely approximate the ends when the steam is admitted, a short stroke only will be imparted to the hammer, whereas when the ends of the back plates are moved further apart, the slide will move further before admitting steam to act on the auxiliary cylinder piston, and therefore a proportionately longer stroke of the hammer will be the result. The auxiliary cylinder, instead of being made separate and connected by a rod to the slide valve of the main cylinder, may be formed in one piece with the main slide valve, for which purpose it is made in the form of a piston valve.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1863, November 5.—N° 2745.

SMITH, Sydney.—This invention relates to safety valves for steam boilers, and to taps for regulating the flow of fluids.

The loading of the safety valve is effected by the pressure of the steam, which passes from the boiler through a small passage in the chamber which contains the upper portion of the valve, the area of which being larger than the under surface, it is kept down on its seat by the pressure of the steam. A small pipe, fitted into the upper chamber, opens to the atmosphere through a small valve, which is weighted to the working pressure. Excess of pressure in the boiler raises the small valve, and relieves the pressure in the chamber, whereupon the main valve opens, and allows the steam to escape from the boiler, until the working pressure is again established therein.

The inlet and outlet passages of taps for regulating the flow of steam and fluids, are separated by a conical or other valve, the upper part of which is enlarged to form a piston, which fits loosely within a chamber communicating at bottom with the inlet passage, so that when the fluid pressure gains admittance to the chamber above the piston (where it finds its way up the loosely fitting sides of the enlarged portion, between it and the sides of the chamber) the valve portion is pressed down on its seat. A small passage leading from the top of the chamber, is opened and closed by a small valve, which by preference is operated by a screw. The opening of the small valve relieves the pressure in the chamber, and permits the main valve to rise, and consequently the flowing of the steam or fluid.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, November 7.—N° 2769.

JOHNSON, James.—This invention relates to apparatus for lubricating the cylinders and parts of steam engines, and consists of an oil vessel or cup containing a central tube which extends from the bottom to within a short distance of the cover, through which a screw valve is introduced, which when screwed down, more or less closes the tube, so as to increase or diminish the outflow of the lubricant; at the bottom of the tube is another valve seating and a spherical valve, which closes the communication with the steam pipe. The lubricant is introduced through an opening in the cover, which is afterwards closed by a tapering screw plug: a screw valve is provided for discharging the water of condensed steam. The apparatus is fastened to the smoke box. When steam is flowing the spherical valve is forced up so as to close communication with the cylinder, previous to which a portion of the first steam having passed the valve the lubricant is caused to rise to the level of the top of the tube. When the steam is shut off the valve falls and allows the lubricant to descend into the steam pipe, and thus lubricate the cylinder, which is an advantage in locomotive engines when descending inclines with the steam turned off.

[Printed, 6*d*. Drawing.]

A.D. 1863, November 7.—N° 2775.

BARCLAY, Andrew, and MORTON, Alexander.—This invention relates to the construction of apparatus for raising and forcing, injecting and ejecting fluids or gases without the aid of machinery. According to one modification, "a circular chamber "or cylinder may be so divided that the lower part may be in "communication with the suction pipe, whilst the upper part may "be in communication with the actuating fluid, or vice versa. "Within the lower end of this chamber or cylinder a flat or "curved annular surface may be formed with an inverted cone in "the centre, so fixed that a free annular opening is left all round "it for the passages of the water or other fluid to be raised. "Within the upper chamber another similar annular surface "piece may be so arranged that it can be adjusted either nearer "to or further from the annular surface surrounding the inverted "cone. Through the centre of this adjustable piece the actuat- "*ing fluid* passes, and on meeting the base of the inverted cone

"impinges thereon, and radiates in thin annular waves towards "the periphery, carrying with it the water or other fluid to be "raised, which enters by the annular opening formed in the lower "part of said chamber. In cases where it is necessary to force as "well as lift the water or other fluid above the apparatus the "discharge chamber may be so formed as to cause the issuing "fluid or fluids to glide gradually into a direction at right angles "therewith before being finally discharged. This may be accom-"plished in various ways. . . . . . . It may be necessary to "combine two of the . . . apparatus, so that the one may merely "raise or lift the water or other fluids, whilst the other then "merely forces it, and by this means supply water to steam "boilers from any depth where an ordinary pump lift is required."

Applies the apparatus to locomotive and traction engines, for the purpose of refilling their water tanks by the use of their own steam.

[Printed, 10*d*. Drawing.]

A.D. 1863, November 10.—Nº 2794.

MASH, JAMES.—This invention is applicable to safety valves and pressure or temperature gauges. As applied "to safety "valves it consists in constructing and employing, in combina-"tion with any known descriptions of safety valves, cylindrical "or other formed vessels containing mercury, having one or "more parts of each expansible upon the application of heat, "and connected with the safety valves in such a manner that "upon increase of heat beyond any predetermined temperature "the valves are lifted from their seats and steam liberated, the "lifting of the valves being thus effected by the expansion of the "mercury contained in the cylinders or other vessels indepen-"dently of the loadings of the valves by weights, as they are "usually used. The connections between the mercury contain-"ing cylinders or vessels and the safety valves, or the mode of "working, may be such that the valves can be opened only by "the expansion of the mercury, or may be such as to permit the "opening or raising the valves from their seats at any times by "other means, as by the pressure of steam or by hand, as is well "known. The cylinders or vessels containing the mercury are "by preference placed in the boilers themselves, or immediately "upon them, but may be placed in other positions where steam

" would have as free access as practicable to them, in order that " the temperature of the mercury may be effected with facility by " any variations of the temperature of the steam." When applied to pressure or to temperature gauges, the mercury-containing vessels are connected with pointers or dials, so that, as the variations in the temperature of the steam cause the expansion or contraction of the mercury, and consequently the vessel containing it, such movement acting through the connections upon the pointer, will cause the latter to indicate correctly upon the dial face, the successive variations in the temperatures and pressures.

[Printed, 10*d*. Drawing.]

A.D. 1863, November 11.—N° 2806.

RICHARDS, WALTER DAVIS.—(*A communication from Henry Messer.*)—This invention relates to caloric engines, to which under certain conditions steam is introduced. The first three chapters are devoted to the improved construction of the engine and furnace, the walls of which are hollow with parts projecting or indented for the purpose of increasing the heating surface. The speed of the engine is regulated, by so connecting the air pump with the cylinder, that the cold air in measured quantities may be discharged therein when the speed of the piston is too high. The course of the air current from the air pump to the furnace is, by the intervention of the regulating valve in the passage, made to pass through the hollow furnace walls, and thence through the grate and burning fuel into the furnace. The piston is formed on the trunk principle, in order that the length of the connecting rod may be increased, and arrangements are provided for lubricating the piston with steam or water. The conduction of heat from the lower to the upper part of the cylinder is checked, so that the packing in the latter part is kept cool, whilst the lower portion of the cylinder remains hot, so as not to diminish the temperature and consequent pressure. Combining the valve seats, chambers, and passages, so as to form part of the cylinder and so avoid separate parts. Attaching the pump cylinder to the working piston of the engine, and employing a stationary compressing piston, in order that the weight of the pump cylinder may aid the working piston in its return downward stroke, the engine being single acting. Preventing excess of speed by so connecting the regulator to the valve, that at such times caloric, comprising ex-

panded air or gas, is allowed to escape and in some cases is lost. The main object is to utilize the caloric which so passes the regulating valve, by employing it to compress air within a cylinder or reservoir, thereby reducing speed by loading the engine. When the rate of the engine is below its normal speed, the heat is increased by sending a regulated portion of this compressed air through the incandescent fuel into the furnace.

The fourth part of the invention relates to combining the constituent elements of steam from an ordinary steam boiler, with the expanded air and gaseous products of combustion within the furnace. The steam is introduced so that it may be decomposed while passing through the incandescent fuel. Steam is also used after the manner of an ordinary steam engine in case of need, and the waste heat from the engine is by a suitable arrangement made to generate steam in a boiler.

[Printed, 1s. 6d. Drawings.]

A.D. 1863, November 12.—N° 2822.

MARTIN, Louis Emile Constant.—This invention relates to apparatus for generating steam. It consists of two vertical cylinders disposed concentrically one within the other so as to form an annular space between them, in which heat and gases are generated; each cylinder is double and contains a water space which communicates above with a hemispherical cap or steam dome; the annular space between the cylinders is horizontally divided by ring formed tube plates, placed a short distance apart, into which the ends of a circular series of short vertical tubes are respectively fixed; the upper tube plate forms the fire-grate upon which the bed of burning fuel rests, openings being made through the water space round the upper part of the outer cylinder to admit the green fuel and air. The draught courses downward through the fire carrying the flaming products of combustion through the short vertical tubes into the lower part of the annular space, thence through a series of radiating tubes horizontally fixed through the water space in the lower end of the inner cylinder, into its central chamber, whence it rises up through a central group of tubes, upon the top plate of which there is another fire bed through which the ascending draught passes to the upper end of the inner cylinder, and thence by a tube through the steam dome to the chimney. The central fire is fed through a tube

which passes downward through the steam dome; the fuel is introduced by means of a rotating feeder disposed at the mouth of the tube, and the central ash-pit is closed by a circular plate valve or damper. Metal bolts are passed through the water spaces and projected from the cylinder surfaces into the flue spaces for assisting the conduction of heat to the water. The bottom of the annular flue space is closed by a hollow flange, wherein the steam in passing through from the steam dome to the engine is superheated.

[Printed 10*d*. Drawing.]

A.D. 1863, November 13.—N° 2837.

HARRISON, Thomas.—This invention relates to coal mining and mineral getting machinery, combined with, and actuated by a steam or other motive-power engine. The power by means of a turbine is applied to the picks and instruments employed; these are attached to the free ends of two lever arms, which act, alternately in the same direction, on each side of the machine, and are respectively by turns forced back by a cam against a spring, the reactive force of which, as soon as the extreme end of the cam curve clears the lever, carries the latter forward with a force equal to the blow of a pick wielded by manual labor. The cams are, by means of toothed gearing fixed respectively upon the turbine and cam axles, caused to revolve at a suitable speed, a blow by each lever being given for every revolution of the cams. The foundation frame, whereon the turbine and operating apparatus are fixed, is mounted on a four wheel truck or carriage, which is moved forward on a tramway after each stroke of the picks, by means of a worm and worm wheel upon one of the carriage axles, at a speed to suit the progress of the work. In coal mines, compressed air, which is conducted to the workings through flexible pipes, is preferred as the motive agent for actuating the turbine, as the air after use not only produces no inconvenience, but advantageously assists ventilation.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 14.—N° 2846.

HARGRAVES, Edwin.—This invention relates to an improvement in preventing the escape of heat from steam boilers and other heated surfaces. It consists in overlaying the exposed superficial

portions of steam boilers, steam pipes, and other heated surfaces, with a coating of sawdust and plaster of Paris, mixed with a sufficient quantity of water for the purpose of reducing it to a plastic state. After application and when set in a dry hard mass, it is found to be an effective preventive to the radiation of heat. In order to strengthen the plastic mass, it is mixed with fibrous substances, such as hair or other similar material, which also causes it to adhere more firmly and solidly to the surfaces to which it is applied.

[Printed, 4*d*. No Drawings.]

A.D. 1863, November 14.—N° 2858.

BROOMAN, Richard Archibald.—(*A communication from Jean Baptiste Pierret and André Schweizer.*)—This invention relates to a rotary engine and boiler especially suitable for agricultural as well as other purposes. "The boiler consists of an outer "cylindrical casing surmounted with a steam dome. Inside this "casing is the furnace running longitudinally in the form of a "truncated cone, it occupies a position concentric with the casing. "Running across the furnace are water spaces which cross each "other at any desired angle, these cross water spaces are open at "both ends to the body of water in the boiler. Towards each "end of the cylindrical casing a tubular plate is rivetted, these "plates receive a number of tubes through which the return of "the flame and products of combustion takes place. The tubes "open into the smoke box at the fore part of the boiler. A ring "with two flanges is rivetted by one flange to the front tubular "plate, while the other flange has bolted to it the front of the "conical furnace, the back end of the furnace is bolted to the "back tubular plate. A door is provided at the fore end of the "furnace. The cylindrical casing is closed at back by a move-"able plate." The engine consists of a cylinder closed at the two ends by plates carrying stuffing boxes, it "is made with an "opening for the outlet of steam while the inlet takes place "through one of the plates. At the upper part of the cylinder "an opening or recess is made for the reception of a moveable "slide upon the back of which springs are made to press. The "axis of the circular piston, which is also the main shaft of the "engine, is placed excentrically in the ratio of one to six of the "radius of the cylinder, so as to be in contact with the moveable

" slide. The piston is formed with two mortises in which two " slides work, and these slides are kept in contact with the interior " of the cylinder by steam introduced behind them. To com- " pensate for the lateral wear of the piston slides a plate is in- " serted inside one of the end plates before named and is kept " pressed inwards by springs placed at the back." When this engine and boiler are used together, the former is superposed upon the latter, and the steam is taken from the steam dome.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 16.—Nº 2875.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Charles Louis Edouard Lequin.*)—(*Provisional protection only.*)— This invention, relating to the manufacture of salt, consists in utilizing the gaseous and other heated products of combustion evolved from blast furnaces, the furnaces of ovens, hot air and water apparatus, steam generators, cupolas and other fire-places and furnaces, by leading their hot draughts (which otherwise go direct to the chimney) through passages or flues under evaporating pans or vessels containing the brine or salt liquor. The invention also consists in the use, in steam generators, of water impregnated with sea salt, in order to obtain the salt held in solution by such water, at the same time that steam is generated for other purposes; before its admission to the boiler, the water is heated to a temperature of 140° or 150° Fah. whereby it is deprived of a portion of the soluble carbonates and sulphates which it contains. The boiler comprises two parts or sections, one (the generator) is superposed upon the other, which constitutes the reservoir wherein the salt is deposited; the communication between the two sections is kept open when the apparatus is at work, but can be closed by a slide or otherwise when required; the furnace is disposed sufficiently far above the reservoir, that the greatest heat shall operate upon the generator above the fire and in the surrounding flues. The proportion of salt deposited in the reservoir depends upon the quantity of water evaporated. Scum and incrustations are removed through the top of the generator, and the saline products through a man-hole in the reservoir. The feed pipe is attached to the lower part of the generator.

[*Printed*, 4*d*. No Drawings.]

A.D. 1863, November 18.—N° 2884.

JOHNSON, John Henry.—(*A communication from Enrico Fava.*)—This invention relates to engines which produce rotary motion by the alternate reciprocating action of two pistons, which partially rotate within an internal annular chamber, concentric with the axis of the cylinder or case. The two pistons are not connected to the main axis or shaft, which contains hollow passages for the admission of steam: two ratched wheels are connected with the pistons, which respectively transmit the effect of their alternate motions to the main shaft by means of pawl catches and notched discs, which are keyed on the shaft, wherein are the two longitudinal steam ways corresponding with four other openings or passages made laterally through the shaft at right angles to each other; through these openings respectively steam is supplied at the proper intervals to the pistons as the shaft rotates by the corresponding openings being brought coincident therewith. The steam enters the annular chamber between the contiguous faces of the pistons, and by its expansive pressure causes one (say the first piston) to rotate, the other or second piston being the while held stationary by the pawl or detent and the ratchet wheel to which that piston is fixed. Having made half a revolution the first piston is then held stationary by its detent and ratchet wheel, while the second piston makes half a revolution, the steam having been admitted through its corresponding port at the same time that the exhaust passage is opened from the first. In this way the admission of steam into the respective corresponding steam ways, and the timely opening of the exhaust passages alternately produces semi-rotary motion of the two pistons, and continuous rotary motion of the main shaft. By a suitable adjustment of the parts which govern the induction passages any degree of expansion may be obtained.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 18.—N° 2890.

STEWART, John.—This invention is designed to increase heating surface in the internal flues of steam boilers and generators, and consists in so forming the interior of flues, that the hot draughts are made to take an undulating course, so as to impinge at intervals upon the bottom part of the flue. The interruption

to the ordinary course of the draught along the upper part of the flue, is caused by a series of transverse hollow arched chambers, depressions, or corrugations, which depend transversely from the top of the boiler flue, and are open internally to the water in the boiler. These chambers may either be all arranged to depend from the top of the flue, leaving the lower part clear from the bridge to the far end for the convenience of removing deposits, or they may be attached alternately to the top and bottom of the flue.

The invention further consists in placing an air admission tube lengthwise in the water space over the furnace. The fore end of this tube is set into the front plate of the boiler, and the after end turns down and enters the flue through the top plate a little beyond the bridge, the fore end being open to the external atmosphere, and the other end to the flue, the effect caused by the admission and heating of the air, being an increase of heat in the flues, and the consumption of smoke.

[Printed, 10*d*. Drawing.]

A.D. 1863, November 19.—Nº 2898.

ELDER, JOHN.—This invention relates more particularly to inverted cylinder steam engines, suitable for driving screw propellers, the principal object being to arrange a compact, convenient, and accessible disposition of the various parts. Three modifications are shown and described. The first consists of two cylinders of different sizes disposed on the vertical plane of the shaft, the smallest cylinder receiving the steam at high pressure direct from the boiler, and the larger cylinder receiving the same steam after it has operated the piston in the high-pressure cylinder, to which the steam is admitted by valves in a casing at the cylinder side, including a cut-off expansion valve; and the transferrence of the steam to the large cylinder and thence to the condenser is effected by valves interposed between the two cylinders. The condensers are formed, one in each side of the framing which supports the cylinders, and are fitted with horizontal tubes disposed parallel to the shaft; the framing is in one casting, formed below the condensers with arches or openings both parallel with and at right angles with the shaft; it is bolted down at the four corners to the sole plate. The water of condensation drains off, by passages formed in the frame casting, to the air *pump* which is disposed outside, together with the cold water

and other pumps, under a rocking shaft which works them by levers, that which works the air pump being linked to the slide block of the piston rod of the low-pressure cylinder; "Randolph and Elder's valve gearing" being used for actuating the valves; a secondary or valve shaft being driven simultaneously with the main shaft carries the valve excentrics, which are reversed by the longitudinal movement of the shaft. The steam cylinders and covers are steam jacketted. In the second modification, the low-pressure cylinders are each connected with two high-pressure cylinders, one disposed above and the other below, the three pistons being upon one rod; the high-pressure cylinders are heated internally by having steam constantly on the non-acting side of the pistons, and all three are constructed to receive steam internally by communicating with each other through the piston rod, which is made hollow for the purpose.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, November 20.—N° 2913.

SEWARD, JAMES, and SMITH, HENRY.—This invention relates to apparatus for preventing incrustation in steam boilers. It consists of a scum or sediment collector formed with a series of compartments, the sides of which in succession rise in steps one above the level of another, all communicating with one common receiver beneath, the bottom of which is shaped so as to incline downwards towards the centre where, by means of a vertical pipe, it communicates with a longitudinal tube which lies along the interior of the bottom of the boiler. The sediment collector is arranged to extend across the boiler, the upper edge of its lowest compartment being about level with the lowest water line; it is disposed so as to face the surface current which flows from the furnace or hottest part of the boiler, the upper edge of the highest compartment marking the plane of the high-water level. Any convenient number of compartments may be fitted in the collector. By this arrangement the edge of one or other of the compartments, is always about the level of the water, so that the scum flows over, enters and settles into the receiver below as fast as it is brought to the surface by the ebullition of the water. One or more collectors in communication with the longitudinal pipe may be used and adapted to suit boilers of different construction. The collectors are separated from the receivers by

perforated plates, which are placed in the several compartments, and serve to still the water and allow the scum to deposit. The contents of the receivers are occasionally discharged through an outflow cock in connection with the longitudinal tube at the bottom of the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1863, November 20.—N° 2927.

JOHNSON, JOHN HENRY.—(*A communication from Richard Bristol.*)—This invention relates to the slide valves of steam engines, and to apparatus for heating feed water for steam boilers, and consists (1), in the use of antifriction rollers disposed between the slide valve and the cylinder valve-surface. Across the face of the valve a series of grooves is sunk to the full depth of the diameter of the rollers; these grooves are so close together that only a small portion of the original valve surface is left, which soon wears away and leaves the load of the valve entirely upon the rollers, which remain continuously self fitting. The valve is extended at several points, so as to give greater length for the rollers and afford room for an increased number. One or more surface bridges are formed across the cylinder ports, and corresponding divisions are made in the valve, additional rollers being added to support a valve of large dimensions; it is also proposed to use bearing pieces or surfaces of hard metal fitted to lie upon the cylinder valve surface, in order that such surfaces may be renewed when necessary. 2. Proposes to heat the feed water for the boiler by distributing it through the heating chamber in broken jets or streams by means of a series of perforated plates, arranged above each other in combination with the exhaust steam, which at each successive discharge passes over and between the plates, thereby heating both the plates and the water while the latter is dropping from plate to plate through their perforations. The necessary inlet and outflowing passages for the steam and water are provided, the separation of fatty matter from the water effected, and a valve is provided to reduce back pressure by allowing a certain portion of the exhaust steam to escape.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 24.—N° 2956.

JOHNSON, JOHN HENRY.—(*A communication from Wilhelm Heinrich Christian Voss.*)—This invention relates to rotary

engines, wherein two discs, placed face to face at an angle with each other, are rotated by the direct action of a series of cylinders and pistons connected respectively by ball and socket joints to the contiguous faces of the discs. The ends of the horizontal shafts whereon the discs are mounted, are caused to revolve at the same uniform speed, by means of a connecting intermediate shaft, the extremities of which are respectively connected to the contiguous ends of the two shafts by means of universal carrier joints. The ends of the steam cylinders (six in number) are centrally fitted with ball joints, the sockets for which are circumposed equidistant upon the face of one of the discs, and ball joints are formed on the ends of the piston rods, the sockets which receive them being disposed in the same manner upon the face of the other disc. The angle at which the horizontal shafts are placed in relation to each other throws the contiguous faces of the discs further apart on one side than the other, the difference in the length of this distance between the nearest and farthest sides taken at the centres of the ball and socket joints, must correspond with the length of stroke of the pistons, which arrive at the end of their inward strokes in succession when at the closest side of the discs, and at the end of the outward strokes in succession when at that point on the opposite side where the disc surfaces are farthest apart. The engines may be made either for single or double action; the steam ways are made through the ball and socket joints, and suitable valves, inlet, and exhaust passages are arranged and provided for distributing and disposing of the steam and working it expansively.

[Printed, 10*d*. Drawing.]

A.D. 1863, December 2.—N° 3034.

HARRISON, Thomas.—This invention, which relates to machinery actuated by steam or other motive power for cutting coal and minerals, is supplementary to a prior invention, for which Letters Patent, dated November 13, 1863, No. 2837, were granted to this inventor.

The power is applied to the cutting tools by the direct action of a turbine, which may be actuated by compressed air in mines, and by steam, or water under pressure, elsewhere. The axis of the turbine rests in suitable bearings upon movable framing, mounted on a truck or other carriage. Fixed upon the axis is a toothed

wheel, which engages with a corresponding toothed wheel of larger dimensions, fixed upon the axis or shaft which carries the revolving saws and operating instruments. These vary in form and construction according to the nature of the work required to be performed. The movable frame which carries the turbine and cutting instruments, is by means of screws, levers, or other suitable device, caused to advance horizontally in guides towards the face of the coal or mineral, and the carriage is moved in the proper direction upon rails when long grooves are required to be cut into the face of the working. When upward or downward cuts are required, the frame must be made to slide vertically, and the movement of the carriage must be adjusted in accordance therewith.

[Printed, 1*s*. 4*d*. Drawing.]

A.D. 1863, December 7.—N° 3076.

PAGE, WILLIAM CHARLES.—This invention relates to the prevention and removal of incrustations in steam boilers, by means of a liquid compound, which consists of 16 lbs. of creosote heated in an iron pot to a temperature of 80° to ensure its fluidity; to this is added 1 lb. of sal ammoniac dissolved in one gallon of warm water; while being mixed the compound is to be kept stirred over the fire, and raised to a simmering heat. When thoroughly mixed, 1 lb. of soda ash is added, the stirring and simmering being continued until a thorough commixture of the ingredients is effected. When cold it is fit for use. About one quart of the liquid compound per engine horse power introduced into the boiler or boilers, will suffice for 6 or 8 weeks. When the water supply is other than hard water, the soda ash may be omitted. Either carbonate of soda, caustic soda, or potash may be used as a substitute for the soda ash.

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 8.—N° 3082.

JAMES, HENRY BENSON.—This invention relates to a composition for covering or coating steam boilers, pipes, and other surfaces exposed to great heat, and (with slight modification) for covering or insulating cold surfaces. The compound consists of ivory or lamp black 4 cwt., of varnish or other resinous binding ingredient, 16 lbs. or 5 gallons; of cow dung or other animal

excrement, 5 cwt.; of fuller's earth, chalk, or other similar earthy substance in a dry state, 5 cwt.; Roman or other dry cement in powder, 56 lbs.; ordinary alkaline matters, 56 lbs.; and sufficient water to reduce the mass to a proper consistency; when used as an insulating medium, say between metal surfaces, such as the plates which cover an iron ship, and the metal sheathing of vessels, 1 cwt. of railway or other cheap grease is added to the mass, which is afterwards brought by grinding in a mill to the required consistency for use. The quantities given are found in practice to yield a good result, although in some cases it may be requisite to vary the proportions.

[Printed, 4*d.* No Drawings.]

A.D. 1863, December 8.—N° 3096.

HENRY, MICHAEL.—(*A communication from Charles Joseph Louis Meynard.*)—The object of this invention is to regulate the passage of aeriform and other fluids, for the purpose of accurately controlling pressure, draught, temperature, and other variable effects.

The apparatus, which acts on a valve or other movable contrivance employed for opening and closing the way passage of the fluid, is worked by either electric, electro-magnetic, voltaic, or galvanic agency, and is itself acted on by the making and breaking electric contact, or the flow and interruption of electric currents, caused by the effects of variation of pressure, draught, or temperature, acting on gauges, governors, or other instruments employed.

As arranged to control the passage of steam, "a mercury pres-" sure gauge is fitted to the steam pipe, and conducting wires are " carried into the tube of the gauge to a point above any desired " or determined level of the mercury. The wires communicate " with an electro-magnet which works regulating apparatus con-" nected with a throttle valve. When the pressure exceeds its " proper point, and the mercury rises to the wires, the electric " contact will be made, and the regulating apparatus will act and " move the throttle valve till the pressure becomes reduced, and " the mercury falls and breaks contact." The invention, in respect to its uses, may be variously applied.

[Printed, 8*d.* Drawing.]

A.D. 1863, December 9.—N° 3103.

COLE, William Henry—(*A communication from Samuel Woodruff and Henry B. Beach.*)—This invention relates to casting and boring segmental steam-engine cylinders. These cylinders instead of being formed in the usual manner, straight from end to end, are cast curved, and form a segment of 90° of a circle. The boring apparatus retains the centre line of the bore on the curve of a true circle, and finishes them perfectly cylindrical. The cylinder is mounted on a suitable bed plate, which carries the bearings for the crank shaft; to the cylinder on each side are cast bearings, which are concentric to the segmental curve. The steam chest is also cast to the cylinder; the steam piston is of the ordinary description, conformed to the curve of the circle, and furnished with packings rings and springs; a curved piston rod is attached to each side of the piston and passes out through a stuffing box formed on each end or cover of the cylinder, uniting above in the form of a ring to which the connecting rod is attached. The piston rod or ring and piston is supported by the concentric bearings, so that there is no undue friction upon any particular side of the cylinder. The boring apparatus consists of a frame or table and a segmental arbor for holding the cutting tool to which a compound circular and feed motion is applied. The arbor is hollow and of the same curve of circle as the cylinder, but of smaller diameter, so as to leave room for the metal chips to fall; one end is elongated and forms a solid bent arm with a hub on its extreme end, by which it is suspended in the concentric bearings during the boring operation. The cutting tool acts by a rotative cutting motion actuated by bevel wheels in connection with a counter-shaft.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, December 9.—N° 3104.

MACKLIN, William.—(*Provisional protection only.*)—This invention relates to apparatus for reversing the direction of the motion of locomotive and other engines, which "consists in the "employment of a metal cylinder bored out to fit the crank "shaft, having two eccentrics (one at each end) if for a double "cylinder engine, or one eccentric if for a single cylinder engine. "On the opposite sides of this cylinder there are two inclined or "spiral slots, and two straight grooves are cut on opposite sides

"of the crank shaft. On the outer side of the cylinder there is "a sliding clutch or collar having two internal projecting pins "which pass through the inclined slots of the cylinder into the "straight grooves in the crank shaft, a backward or forward "motion being given to the clutch or collar by a forked lever; "the pins traversing in the straight grooves of the crank shaft "and in the spiral slots of the cylinder causes the latter to "revolve and bring the eccentrics into such a position as to "move the slide valves and reverse the motion of the engine."

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 10.—N° 3111.

TURNER, Henry.—This invention relates to apparatus for preventing the explosion of steam boilers, and consists in connecting a float in the steam boiler to the flue damper by means of a lever and catch or other suitable connection. When the float descends, owing to the sinking of the water level, the lever is effected and the catch liberated, which causes the damper suddenly to close, thereby stopping the chimney draught and damping the fire. A fresh supply of water should then be pumped into the boiler; if however this is neglected to be done, and the water level still continues to descend, the float referred to or a second float acting on a tap or valve, admits steam and water from the boiler into the furnace and quenches the fire therein. The pipe opened for this purpose is also in communication with another pipe connected to the safety valve box, whereby the waste steam, in the ordinary time of working, is conveyed to and allowed to escape beneath the grate-bars for the purpose of assisting combustion and preventing the adhesion thereto of clinkers; this pipe may be conveyed through the bridge and made to deliver the steam within the furnace in face of the course of the flaming gases. The whole of the apparatus is enclosed within cases, and should be kept under lock and key beyond the control of the workmen.

[Printed, 10*d*. Drawing.]

A.D. 1863, December 12.—N° 3140.

BROOMAN, Richard Archibald.—(*A communication from Victor Barbier.*)—(*Provisional protection only.*)—This invention relates to steam engines, in the cylinders of which the steam is

retained after having lost a portion of its elastic force by working the piston therein, and its primitive tension is restored by the admission at each end of a stroke of a limited quantity of very hot steam at a pressure of about 7 atmospheres, so that no escape steam is lost: the piston rod is connected to the crank in the usual way, but the length of stroke falls short at each end of the length of the cylinder, which is horizontally disposed upon the boiler. A chamber is provided at each end of the cylinder for receiving the water condensed therein during work, and also pipes for its return into the boiler. Whilst the crank is turning the centres, steam is admitted behind the piston at the ends of the cylinder respectively, and cut off as soon as the centres have been passed, and the piston is driven to the far end of each stroke by the expansive force of the steam which is to be maintained at its maximum force by the vaporization, at the end of each stroke, of the water of condensation contained in the cylinder ends, which is effected and the pressure re-animated by the limited quantity of steam admitted under high degrees of pressure. The intention apparently being to compress and partially to condense the spent steam of each stroke, by the water of condensation contained in the space formed at each end of the cylinder, and to restore the normal working force of the steam at the commencement of each stroke by the contiguous heat of the boiler and the admission of the fresh steam under a high degree of pressure.

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 12.—N° 3148.

WARD, PETER.—This invention relates to packing for pistons, piston rods, and other parts of machinery, and to the mode of preparing the material, which consists of esparto grass. This grass is first steeped in a solution of caustic soda, at a temperature just below boiling heat for some hours, and afterwards boiled in a solution of carbonate of soda, until sufficient of the earthy and gummy matters have been removed, in order to prevent the esparto sticking when in use: or the esparto is first boiled in a solution of the double sulphide of calcium and sodium, then washed in water acidulated with muriatic acid, and afterwards in hot water. The quantity of the caustic soda required to a ton of esparto grass varies from 2 to 3 cwt. and the time allowed for steeping is from 4 to 6 hours. The quality of packing thus treated, will do for all

ordinary work, but for the inside spindles of locomotives, and where a high degree of steam pressure is worked, a larger quantity of soda will be required to remove the gum and resinous and other matter from the fibres, care being taken that a sufficient quantity be allowed to remain to prevent charring. When prepared, the grass is afterwards dried, oiled, and opened for spinning into packing strands and afterwards manufactured into gasket or rope or otherwise, and well saturated with oil, tallow or other lubricant.

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 15.—N° 3162.

DE STAINS, Victor.—(*Provisional protection only.*)—This invention relates to "steam apparatus for raising and forcing "water applicable to steam navigation and water works in "general." The apparatus comprises "a cylinder and a floating "piston working up and down in the said cylinder through the "alternate introduction and condensation of steam, and by the "same alternate motion pumping and forcing water or any other "liquid placed immediately underneath, thereby transmitting the "action of the steam directly and immediately to the substance "to be put in motion without the employment of any inter-"mediate or complicated agency, whether the steam be at high or "low pressure; whether drawn in a condenser or condensed in "the cylinder, and whether water, ether, or any other substance "expanded into an elastic fluid be employed as a motive power "the principle is invariably the same in its application."

[Printed, 6*d*. Drawing.]

A.D. 1863, December 15.—N° 3165.

BOX, William Williams.—This invention, relating to fire-bars for locomotive and other boiler furnaces and fire-boxes, and to furnaces generally, is partly described in a Provisional Specification dated June 15, 1863, No. 1491, and is fully described as follows:—"I make the said bars in transverse section of an oval "or egg shape, and place the small part downwards. I also make "them hollow and the ends cylindrical; upon the cylindrical ends "I cut screw threads to screw into angular or curved junctions "or couplings, which are also hollow, and are made to screw and "unscrew at the return. In this manner I join any required

"number of bars, formed as above or in any other suitable shape, "together, so as to form a 'grate' or set of furnace bars of the "required dimensions. By this mode of construction I obtain a "water passage through the entire length of bars. I admit the "water by suitable means at one corner of the grate, and it then "has to flow through the first bar to the opposite end, return "through the next bar, and so on backwards and forwards "through all the bars, and finally out again from the bar at the "opposite end of the grate."

"Mounting the hollow bars upon a skeleton cross frame hinged "at one end, and raised and lowered (with the bars) by a lever "and balance weight. This frame gives support to the ends of "the bars. In order to keep the said bars charged with water I "make the hinge or joint upon which they rise and fall also "hollow and water-tight like a hollow plug; at one end I carry "a pipe to the supply tank, or to a small feed cistern specially "provided, and from the hollow plug at the other end another "pipe to the feed pump, and thence or otherwise into the boiler. "Upon these pipes I place suitable stop-cocks for regulating the "flow of water and keeping the bars constantly charged, and in "this way the fire-bars become either part of the boiler or act as "steam generators or water heaters, while the water is made their "preserving medium from the destructive action of the fire, the 'tipping frames enables the fire to be instantly shut out of the "grate or furnace in case of need."

[Printed, 10*d*. No Drawing.]

A.D. 1863, December 16.—N° 3182.

FELL, John Barraclough.—This invention, which relates to "railway engines, carriages, and permanent way for steep in-"clines," is supplementary to prior Letters Patent granted to this inventor, bearing date January 26, 1863, No. 227, and includes:—

1st. A modification of the previous invention, which consists in connecting the pistons which give motion to the auxiliary horizontal traction wheels that work against the middle rail. "This "is accomplished by two connecting rods, one end of one connect-"ing rod is jointed on a pin or crank on the axis of one of the "horizontal wheels, receiving motion from one piston, and one "*end of* the other connecting rod is jointed to a pin or crank on

" the axis of one of the wheels driven by the other piston, and the " opposite ends of these two connecting rods are jointed to the " same block, sliding in guides placed in a line parallel to the " motion of the pistons."

2nd. Arrangements for giving motion to the horizontal traction wheels by means of one cylinder, which is placed in the centre, with a crosshead fixed on the end of the piston rod, to the ends of which crosshead, the connecting rods which actuate the wheels are jointed.

3rd. " Consists in modes of driving both the horizontal traction " wheels and the vertical carrying wheels by the same pair of " cylinders."

4th. " Consists in dispensing with flanges on the horizontal " traction wheels, and in using check or guard blocks, which are " fixed to the framing of the engines or carriages, so as to pass " under the flange of the traction or middle rail, or under that " part of the rail projecting on each side of the chair to which the " the rail is secured."

5th. " Consists in applying brakes directly on to the middle or " traction rail with or without springs."

6th. Relates to a mode of applying sand to the middle or traction rail when in a slippery state, by means of a jet of steam or water, and

7th. Consists in the use of wrought iron for the central rail, which is fixed on wrought iron chairs.

[Printed, 2s. Drawings.]

A.D. 1863, December 17.—N° 3186.

CLARK, William.—(*A communication from Charles Weyher.*)—(*Provisional protection only.*)—This invention relates to apparatus for indicating the level of water in steam boilers, and consists of a tube or tubes of thin metal placed concentric within each other, and soldered together at alternate ends; one end of the outside tube is horizontally fixed to the inside of the boiler shell, leaving the other end free projecting inwards; to the latter end there is a float attached by a lever arm which also grips the end of a rigid rod passing thence to the outside of the boiler, through the centre of the inner tube. Upon the outer end of this rod there is a finger which indicates on a graduated scale the position of the float, and thereby the height of the water level is discovered.

The tubes being thin yield to the tortile strain caused by the leverage of the weight of the float on the end of the lever arm; the position of the float and mode of transmitting its motion will vary according to the form and construction of the boiler to which the apparatus is applied. The indications are more clearly ascertained by the use of a curved plate of sheet iron, whitened or silvered, and keyed on to the spindle end; this plates indicates behind a sheet of glass, the variations of the position of the float on the index with considerable clearness, the inside of the case being painted black.

[Printed, 10*d*. Drawings.]

A.D. 1863, December 19.—N° 3212.

HOWDEN, James.—This invention relating to steam engines, and boilers, and to apparatus connected with working them, consists of several arrangements and modifications in the general construction of engines and boilers, chiefly for marine, as also for other purposes. The first part described consists in placing two pairs of "double expansive engines" with inverted high and low pressure cylinders in such parallel position, that their respective crank shafts lie in parallel lines on the same horizontal plane. The steam is worked from the high to the low pressure cylinder, after the manner described in the Specification of Letters Patent granted to this inventor bearing date 4th January 1862, No. 34. When two pairs of these engines are employed to drive a single screw, a spur wheel on each crank shaft gears a pinion on the propeller shaft, but when applied to drive twin screws, they are driven separately direct from the crank shaft of each engine, in which case it is not absolutely necessary that they be disposed with regard to each other in parallel lines. The condenser is placed between the engines, partly supporting the cylinders of each pair, the remaining supports being standard frames rising from the sole plate, the guide frames for the piston rods being nterposed between the condenser and the outer frame standards. Surface condensing is preferred, the tubes in the condensers being horizontally disposed; a common injection apparatus may be employed. The whole of the pumps are placed in front of the engines on the lower part of the framing, and are actuated by a pin in an auxiliary crank or disc on each crank shaft; each pin works in a sliding block which block works between the bars of a

slide frame, whereon, on one side, are attached the rams for working the feed and bilge pumps, and to the other side the rods of the air and circulating pumps, which with their valve boxes are disposed at the central part of the framing, and the feed and bilge pumps at the outer ends.

The other improvements and modifications in engines consist in simplifying the construction of the starting gear. Placing each pair of engines at such an angle with the horizon that their connecting rods may be attached to the same crank shaft. Working the before described arrangement of pumps in connection with other marine engines, and inverting the cylinders of grasshopper lever engines, and placing their piston rods in direct communication with single central working beams. The invention also extends to the use of filtering beds in the hot well, to purify the water for feeding purposes; and to various improvements in cut-off valves, supplementary to the before-named previous invention; concluding with a supplementary improvement to a tubular boiler (also described in the said previous invention) which consists in placing a separate series of tubes directly over the fire, access to which is obtained by doors separate from those by which access is obtained to the upper series, both series being contained in the same water chambers.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, December 21.—Nº 3218.

TAYLOR, Robert Heaton.—This invention relates to apparatus for lubricating the cylinders of steam engines, and the object sought is to prevent the waste which usually takes place by the sudden discharges of ordinary lubricators. The present invention causes the lubricant to pass into the cylinder only at the time of its being charged with steam, the pressure of which opens a valve that closes when the steam is cut off and exhausting. The lubricator consists of a spherical vessel with a screw plug at top for replenishing or supplying the lubricant, and a taper plug or tap through the pedestal, to open and close two passages which communicate with the cylinder; the steam each stroke of the piston enters one passage and causes the lifting of a small valve which governs the other passage, through which at such times only a limited quantity of the lubricant is allowed to descend, the valve closing simultaneously with the reduct the pressure, so soon as the steam is cut off.

[Printed, 6*d*. Drawing.]

A.D. 1863, December 21.—N° 3219.

PATERSON, Robert.—The object of this invention is to obtain in steam engines an improved vacuum, at the same time that the surface or size of the condenser employed is reduced, and a lesser than the ordinary quantity of injection water required, whilst the feed water is supplied to the boiler at a comparatively high temperature. A condenser combining surface and injection condensing as applied to a marine engine is described. An enlargement is formed on the top of the condenser to receive the constructive parts, which are arranged in such a way as not to impede the inward flow of the steam, which enters by a passage opening into one side of the top. The cold water enters by a pipe in the centre of the crown, and is received in a perforated dish, whence it falls in a shower upon the entering steam; the water thus heated, together with the condensed steam, falls into a shallow vessel disposed across the condenser, whilst the uncondensed steam passes over the external surface of the vessel and amongst the condensing tubes which are horizontally disposed in the body of the condenser below; a series of wood floats swim upon and cover up the surface of the water in the vessel, and so prevent evaporation. The quantity of water admitted is regulated by a valve, which is acted upon by a diaphragm, sustaining the pressure of the atmosphere on a limited space outside, whilst the water from the hot well acts against its inner side, and tends to open the valve, which action is limited by a screw stop, whereby the valve may when necessary be entirely closed. An air vessel is applied near the feed pump to the pipe leading from the collector in order to ensure the perfect action of the pump. A vertical section of a marine engine is also exhibited and described, with a modified arrangement of the parts of the condenser, formed in the hollow framework supporting the cylinder, which is of the inverted class.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, December 21.—N° 3220.

WILSON, Edward, and LINDSLEY, George.—This invention relates to apparatus for feeding locomotive and other boilers, raising water and other liquids.

Fitted above in connection with a steam boiler is a closed cylindrical vessel, whence a pipe, furnished with a stop cock, extends downwards through the shell of the boiler to below the

water level. Another pipe, also provided with a stop cock, forms a communication between the upper part of the vessel and the steam space of the boiler, and a third or suction pipe, also fitted with a stop cock, reaches from the bottom of the vessel to below the surface level of the water in the reservoir or well. "Now supposing the boiler to require feeding, we shut off com- "munication between the vessel and the boiler, and open the "steam and feed cocks, whereupon steam fills the vessel, and "passing through the feed pipe, expels the air therefrom, and "fills it; we then shut off the steam, the steam in the feed pipe "and vessel becomes condensed, a vacuum is formed, and water "or other liquid enters the vessel through the feed pipe. The "feed cock is next closed and the others opened, when the water "will run into the boiler, the pressure of steam above and below "it being equal."

"If the vessel is to be used exculsively for raising liquids above "the level at which it is fixed, the water from the boiler may act "upon the liquid through the intervention of a piston fitting but "working freely in the vessel."

[Printed, 10*d*. Drawing.]

A.D. 1863, December 22.—N° 3236.

BROOMAN, Richard Archibald.—(*A communication from Claude Jonchier*.)—This invention relates to apparatus for feeding steam boilers and condensers, and consists in the employment of a closed vessel or chamber, interposed between the supply cistern and the boiler, and capable of being put into communication with either, so as to be filled out of the former and discharged into the latter by the gravity of the water. The chamber employed may be a narrow tubular vessel, furnished with a two way cock both at its upper and its lower ends. These cocks communicate respectively with the supply cistern and the boiler. When the cock is turned to open communication with the boiler, the opening to the cistern is closed, and steam is at the same time admitted to the upper part of the vessel, which is emptied by the gravity of the water contained, so soon as the steam pressure therein is equal to the boiler pressure. A constant water level is maintained in the boiler by the termination at that point of the lower end of the communicating water pipe, which descends through the top of the boiler down to the water level, as the water only flows out when the level of the water in the boiler sinks below the end of the pipe. In supplying condensers with water the same apparatus

is applied, wherefrom when heated the water is withdrawn by a pump or otherwise. In some cases a condenser for condensing the exhaust steam from the engine is placed between the supply cistern and the boiler, the supply of water to the condenser being regulated by an intermediate vessel, and a second intermediate vessel regulates the discharge of water from the condenser to the boiler, which is thus fed with a heated supply.

[Printed, 8*d*. Drawing.]

A.D. 1863, December 23.—N° 3248.

KNOWLES, JOHN.—This is an invention of apparatus for removing sediment and scum from the interior of steam boilers, which consists in the use of longitudinal perforated duplex pipes, placed internally along the bottom of the boiler in communication with an external discharge cock in front, the outflow area of which is equal to all the perforations in the lower pipe. These pipes consist of short lengths of double pipes fitted together by flanges; they are so placed that one pipe is above the other, the under surface of which is perforated at intervals from end to end; the upper pipe communicates with the lower pipe, and by branches and vertical pipes, with broad scum dishes or cisterns disposed within the boiler about the water level, extending nearly the whole width; these dishes have openings along the front and back, and floating slides to prevent all but the scum on the surface of the water from entering therein. When the discharge cock is opened, the sediment at the bottom of the boiler is drawn through the perforations into the lower pipe and ejected through the discharge cock, as also the contents of the upper pipe and the accumulations in the scum dishes. Two other examples of skimming apparatus are described as modifications of the invention.

[Printed, 8*d*. Drawing.]

A.D. 1863, December 28.—N° 3274.

HALL, THOMAS.—This invention consists in surrounding the external heating surfaces of steam boilers, with narrow closed water chambers or tanks conformed to the shape of the boiler, in order that the interspaces between the boiler and the surrounding chambers may constitute the external flues.

As applied to a cylindrical boiler with internal flues, a closed water tank, with or without tubes, is placed at the back end of the boiler. In the front of this tank there is a curved recess, wherein the products of combustion pass downward into a flue or flues

under the boiler, thence rising to the right and left into side flues formed between the side tanks and boiler, and finally onward to the chimney.

"The water tanks or chambers may all be in communication "with each other or otherwise, and the pump forcing the feed "water into the boiler may draw its water from any of the tanks, "or the steam generated in the tanks may be employed for heat-"ing or other purposes."

[Printed, 10*d*. Drawing.]

A.D. 1863, December 28.—N° 3279.

CLARK, WILLIAM.—(*A communication from Louis Amédée Lemaire.*)—(*Provisional protection only.*)—This invention relates to variable expansion slide valves for regulating the supply of steam or other fluid to the cylinders of engines. It consists first in forming the cylinder ports at an angle more or less oblique in inverse directions, instead as heretofore in parallel lines at right angles with the axis of the cylinder. 2. Consists, with or without a cover, of a slide the distributing openings of which are formed at oblique angles corresponding with the angles of the cylinder ports. 3. Relates to the application of a regulating slide valve with an emission aperture, the sides of which form an angle corresponding with the angle of the ports. This slide is placed on the back of the main slide valve, and acts under the influence of a regulator with a to-and-fro motion across the main slide which is actuated in the usual direction by an excentric. These peculiar movements of the slides, combined with the obliquity of the ports and openings, permit of a variable expansion coincident with the slightest variation in the speed of the engine, whilst the distribution of the steam is under the immediate influence of the regulator.

[Printed, 8*d*. Drawing.]

1864.

A.D. 1864, January 4.—N° 18.

HALL, WILLIAM.—This invention relates to high and low pressure condensing rotary engines and to a rotary pump. The engine consists of a cylinder closed with a cover at each end; a stuffing box is fitted in the centre upon each cover, through which

the main shaft passes; the piston is a cylindrical metal drum or casing much smaller in diameter than the cylinder; it extends the whole length of the cylinder and abuts against the two covers; the axis of the piston is eccentric to its centre, so much so as to bring its longest radius in frictional contact with the cylinder side, and leave a broad space between it and the cylinder on the opposite side of its axis. Along the line of contact a packing strip is sunk into a recess grooved along the surface of the piston, which strip, as the piston revolves, works against the inner surface of the cylinder, and maintains the sliding contact steam-tight. The slide, which divides the space, forms the resistance to the steam; it is the same length as the piston, abuts at each end against the cylinder covers and works in a radial groove, which opens longitudinally along the cylinder side; the steam is admitted into the groove behind the slide, whereby the outer edge of the slide is kept in constant steam-tight contact with the periphery of the revolving piston; the steam is admitted to the cylinder through a passage in the slide, which opens out on one side near the lower edge, the eduction or exhaust port being on the other side, through the cylinder. Condensing engines on this principle are constructed with rotary air pump and governor, valves for working the steam expansively and also for reversing, which valves can be employed in a high-pressure non-condensing engine. A fly wheel is required, as at one point of the revolution there is a "dead "centre" which occurs while the piston packing strip is passing under the edge of the slide. The air pump is similar to the engine, consisting of a cylinder, eccentric mounted piston, abutment slide, and pump cylinder covers fitted with central bearings for the shaft. A vacuum is formed in the cylinder, and the top of the abutment slide is open to the atmosphere, the pressure of which keeps the bottom edge of the slide to its work against the piston. A condenser is described wherein, by means of a perforated injection pipe, the cold water is distributed within the condenser in the form of spray. A governor is employed, in connection with which, by means of a graduated projection on a cam, the steam is cut-off at the required point. When two engines are worked conjointly, the fly wheel is dispensed with.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1864, January 5.—N° 33.

KIDD, JOSHUA.—This invention relates to regulating the supply *liquids*; the form of the apparatus employed requires varying,

according to the purpose to which it is applied. The apparatus acts on the well-known principle of the bird-cage fountain, and consists "in forming a receptacle of any convenient shape for "holding oil or water. I connect to the bottom of this recep- "tacle a pipe, and convey the liquid through it to a receiver "which I call the regulating chamber; this chamber may be "placed in any convenient position below the receptacle. . . . . "The same result may be obtained by slightly altering the above "arrangement; first, by making the receptacle for holding the "liquid air-tight, and attaching a pipe to the bottom of it to "conduct the liquid to the regulating chamber. When the lower "termination of the pipe in this chamber is unsealed with "liquid, bubbles of gas or air will rise up it to the receptacle, "and a proportionate amount of liquid will descend sufficient to "seal the termination of the pipe, when all further circulation "ceases till the liquid again falls below the aforesaid pipe in the "regulating chamber," the object being to maintain the supply at a uniform level, which is also accomplished by means of a float in an open vessel.

The invention may amongst other uses be applied to apparatus for generating steam, lubricating axle boxes, supplying public lamps with naphtha, and supplying oil for generating gas.

[Printed, 10*d*. Drawing.]

A.D. 1864, January 7.—N° 49.

BOND, JOHN.—(*Provisional protection only.*)—This invention, relating to water gauges for steam boilers and vessels, consists in employing a glass tube, fixed near the boiler fire-door or other place convenient for inspection, secured in a perpendicular frame in the ordinary way and made steam-tight by packing; within the glass tube is a rod or tube of light coloured metal, held by the glass tube at one end and by a suitable fixing at the other. "On "this rod or metal tube is a large tube connected with the float; "this tube passes through the float which is made of as light "and incorrosive a substance as possible; the tube supported or "kept in position by a rod connected with the float is the moving "mark in the glass tube, by which the height of the water in the "boiler is indicated. By preference the loose tube sliding on the "fixed rod or tube should be dark, and the rod or tube light, so "that the movements in the tube may be distinct in the glass."

[Printed, 4*d*. No Drawings.]

is in a central position, both the cylinder ports are respectively covered by the plain surface of the ends of the valve, so that these surfaces overlap the steam port towards the exhaust in the proportion of about 59 to 60, in order that one port may open to that extent to the exhaust before the other port opens to the steam, the extent being governed by the desired amount of expansion. At the end of the stroke both ports are fully open, one to the steam and the other to the exhaust. As the valve slides towards the opposite end of its movement, the end of the flat surface, which before was coincident with the inner edge of the steam port (then open) gradually passes over and closes it, and the other port is at the same time closed by the flat surface on the opposite side of the hollow; both ports then remain covered until the piston has completed the effective portion of the stroke; the valve has then been so far moved that the steam ports begin to be uncovered by the surfaces of the valve moving beyond them; the valve continues to travel until the two ports are open respectively to the steam and exhaust, and then commences to move back when the same operation is repeated.

[Printed, 6*d*. Drawing.]

A.D. 1864, January 12.—N° 77.

NICHOLLS, Henry Martyn.—This invention in generating and applying motive power, relates principally to the elastic force of fluids, generated or augmented by heat. The mode adopted for generating and applying such motive power, is described and illustrated in its application, in the form or nature of steam, which is generated from comparatively a small quantity of water or other liquid, in a boiler or directly in a cylinder, to act against the piston with which the cylinder is fitted. The piston is caused to work steam-tight by a suitable metallic packing; it is so connected with another piston or plunger, adapted to work in a second cylinder similar to the first, that an outward movement of the first piston will cause an inward movement of the second. The second cylinder is filled with oil or other liquid and communicates with two cylinders of smaller diameter, rectilineally disposed and fitted with pistons mounted on one piston rod, which is connected to and, by means of a rack and pinion, actuates the machinery to be put in motion. The action of the *pistons in* the small cylinders, is maintained by means of the oil

or other liquid which is expelled from the second cylinder by the action of the plunger piston therein. When the plunger pistons in the first and second cylinders have completed their stroke, the steam in the first cylinder is exhausted into a condenser or into the atmosphere, and the plunger pistons in these cylinders return to their normal position, the oil or liquid then returns from the small cylinders, and fresh steam being supplied to or generated in the first, the operation recommences and is continued. The furnace is enclosed and disposed under the first cylinder, which is surrounded with flues for the passage of the flaming products of combustion derived from oil or other inflammable liquid. The air necessary to support combustion, having previously passed through intermediate channels in the condenser, is forced into the combustion chamber by a fan.

[Printed, 8*d*. Drawing.]

A.D. 1864, January 12.—N° 78.

LANE, John.—This invention relates to a motive-power engine, a steam generator and a refrigerator. The engine is of the rotary class, combining a revolving cylinder (which is closed with a cover at each end) a piston eccentrically mounted on the cylinder axis, and a central axis or compound hollow shaft in two halves, each with solid ends rectilineally disposed; the end of one half is reduced in diameter to fit into a socket in the contiguous end of the other half shaft in which it centres, the cylinder being fixed upon one half and the piston on the other. The cylinder carries a resistance slide, which has convergent and divergent action, caused by the close contact of its inner edge against the periphery of the eccentric piston, as the two revolve in contrary directions. The space between the piston and cylinder (in transverse section) is crescent formed, into which the induction and exhaust ports open respectively on each side of the slide. The steam forces the cylinder to revolve in one direction and the piston in the opposite. The outer ends of the compound axis rest in fixed bearings; through one bearing the steam enters the hollow axis and cylinder passage leading to the induction port, while the opening from the axis is coincident with the cylinder passage, at other points it is cut-off; the exhaust passes off through the other half of the axis. A fly wheel is mounted on the outer end of each half axis; these wheels which

revolve in contrary directions, are furnished with crank pins disposed respectively at half centres; two connecting rods working on these pins, one under and the other over, are coupled to the two throws of a crank shaft, the revolutions of which are thereby rendered continuous. The steam generator consists of a number of tubes horizontally placed in rows above each other, gradually increasing in size, and decreasing in number respectively from the bottom row to the top; these pipes communicate at each end with a water space, forming the back and front of a rectangular boiler casing, united by sides which incline upwards, so as to leave a narrow opening at the top, through which after coursing upwards amongst the tubes, the products of combustion pass to the uptake, whereon is horizontally disposed a cylindrical reservoir, which receives the steam through tubular connections from the upper part of the casing or boiler shell. The refrigerator is a closed vessel with a double bottom; above the false bottom the interior is so divided by a number of partitions inclining towards each other, as to form a series of wedge shaped cavities, the lower ends of which open below the false bottom; the spaces or cavities between are filled with the cold water, which circulates by means of pipes, in a passing current. The water of condensation trickles down the external sides of the cavities into the space between the two bottoms whence it is drawn off for use.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, January 12.—N° 86.

MARTIN, Louis Emile Constant.—This invention relates to apparatus for supplying steam boilers with water. The water is also purified by the apparatus, which consists of a closed cylindrical vessel filled with a number of perforated plates disposed in sections slightly inclining from a horizontal position. The water is supplied through a tube above the apparatus, at the top of which it enters after passing down a vertical pipe containing perforated diaphragms; when entering the refrigerator, it is in a comminuted state and descends through the successive diaphragms in the form of rain. Superheated steam is introduced through a pipe at the bottom of the apparatus; the water heated thereby is conveyed through suitable pipes, in connection with the pump, to be forced into the boiler. The steam generated by the superheated steam passes off to the boiler, above which the apparatus

is superposed. It is preferred that the steam be superheated by the waste heat passing off with the products of combustion from the flues to the chimney. The supply of water to the apparatus will be regulated by a cock or valve in such manner as to prevent injurious condensation. The water will deposit its salts and impurities upon the perforated diaphragms. The steam may be generated in a second boiler and conducted through the superheating apparatus before entering the vessel.

[Printed, 10*d*. Drawing.]

A.D. 1864, January 13.—N° 96.

ENGLISH, Thomas.—This invention relates to compound reciprocating motive-power engines, which are compact in construction and give off direct rotary motion. An engine consists of a main cylinder of unusual length, made so to receive a piston which contains between its two faces, transversely disposed, a second cylinder, wherein a piston works at right angles to the main cylinder. This second or piston cylinder has a passage through it at right angles to its axis to accommodate the crank shaft, which passes through it and rests in bearings attached to the sides of the main cylinder. The piston in the piston cylinder receives the throw of the crank, which is made to revolve by the conjoint action of the two pistons. The steam enters through the sides of the main cylinder, first to operate in each end of the piston cylinder, whence it exhausts into the main cylinder, acting expansively upon the large piston at a diminished pressure. Metallic packings are employed for the pistons. The small piston has a single tongued ring round each head. The packing for the large piston consists of a tongued ring round each head; these rings are united by several longitudinal slips, and between the two rings are segments of a third, which divide the outer surface into eight steam-tight spaces, besides the spaces for the shaft slot and the piston cylinder ends. This arrangement is adopted for the following reason. "The pressure of steam on " the large piston has a resultant acting along the axis of the " cylinder, and the only force to balance this being the load on " the crank pin, it follows that except when the crank pin is " directly in the line of the axes of the cylinder a 'couple' is " produced which gives the large piston a tendency to bear " equally against the sides of the cylinder. The direction in

"which this couple acts is opposite to the direction of revolution "of the engine. This couple is greatest in leverage, the "pressure and load remaining the same when the crank is hori-"zontal, and vanishing when the crank becomes vertical." To balance this, steam pressure is introduced between the outer cylinder and portions of the outer shell of the large piston, so as to produce by means of a valve, an equivalent "couple" in the opposite direction.

[Printed, 10*d*. Drawing.]

A.D. 1864, January 15.—N° 114.

HOWARD, James, BOUSFIELD, Edward Tenney, and PINNEY, John.—This invention relates to agricultural steam engines and the necessary apparatus for the operating of ploughs and other tilling instruments, by the conjoint action of two engines, placed respectively at opposite sides of the field, instead of making one engine of sufficient power to haul the implements, or when two have been used, of working them alternately, and although (as stated) it has been proposed to unite the power of two small engines, and so make them available to perform the work of one large engine, the system at the date of this invention had not been brought into practical use. Each small engine is fitted with two winding drums, to which a hauling rope and a driving rope are respectively attached; these ropes extend from engine to engine across the field, and when in operation are alternately wound on and off their respective drums. The implements are attached to the hauling rope, which when being wound on the drum of one engine, is drawn off the drum of the other, at the same time that the latter engine is forcibly drawing the driving rope off the drum of the engine engaged in hauling the implement, whereby as the drums are connected by gearing, the united power of both engines is brought to bear upon the hauling drum. In this manner the work proceeds by the combined power of the two engines, each one alternately hauling the implements, assisted by the other by means of the driving ropes. The engines are moved intermittently, so that the work performed lies in a direct line between them; if required to remain stationary snatch blocks are anchored at the extreme ends of each course.

The engine frame is mounted on two driving wheels behind and one steering wheel in front; the boiler, which is of the

tubular class, is transversely placed upon the frame in order to afford room for the mounting of a drum on each side of it on eccentric bushes loose upon a longitudinal shaft, which passes under the boiler; a toothed ring or a spur wheel is concentrically attached to the end of each drum; these gear into pinions on the crank shaft, whereby the drums are set in motion. Whilst the hauling rope from each engine is alternately being paid out, the drums are lowered out of gear with their respective driving pinions by half a turn of their eccentric bush, which brings the minor radius of the bush above the centre of the shaft; when required to wind on, the eccentric bush is turned to its normal position, which raises the drum and brings the wheels into gear. When the engines are required to move on, the travelling wheels are set in motion by means of bevel gearing. The ropes are wound on and off sideways to and from the engines. Other modifications of engines are shown, with longitudinal twin tubular boilers placed very low under the drums or drum. In these engines the boiler forms the framing; the main axle is attached to the top of the furnace, which is common to both boilers; the driving wheels carry internal gearing, and the cylinders are inverted and mounted upon a frame supported by the boiler. The Specifications of two prior inventions are referred to, dated respectively February 25, 1861, No. 484, and April 7, 1863, No. 880.

[Printed, 2*s*. Drawings.]

A.D. 1864, January 16.—N° 119.

GILL, John.—(*Provisional protection only.*)—This invention relates to apparatus for converting the momentum of bodies, when reversed in their direction of motion, into a reactive force. It is applicable to those heavy parts of machinery which have reciprocating movements, such as beams and pistons of steam engines, or the travelling type tables of printing machines. The "apparatus consists of a hollow metal cylinder closed at the one "end, into which is fitted an air-tight movable piston, so that if "the piston be inserted and pressed into the cylinder the air "contained in the cylinder will be compressed until it acquire an "expansive force equal to the pressure applied from without, "and if this pressure be removed the piston will be forced back "to its original position by the expansion of the compressed air

"in the cylinder. In applying this apparatus to aid in reversing "the motion of those heavier portions of machinery which have a "reciprocating movement, the cylinder is placed in the line of "such motion, and is made of suitable diameter and length so "that the momentum of the reciprocating portions may be "expended in forcing the piston into the cylinder and com-"pressing the air therein contained, the expansive force of which "will then reverse the motion and restore in the opposite direc-"tion a momentum equal (except in so far as effected by the "friction of the parts) to that which has been just expended in "the previous forward motion. A similar apparatus would of "course be placed at each end of the reciprocating movement so "that the motion might be reversed at either end with the like "facility." The invention in its application extends to railway buffers, and may be applied to ships, projecting from the stem, for the purpose of mitigating the effects of collisions at sea or otherwise.

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 16.—N° 125.

MOUNTAIN, Jacob Jehoshaphat Salter.—(*Provisional protection only*.)—This invention, relating to "means of obtaining "motive power by the combination of steam power with at-"mospheric or hydraulic pressure or both," consists in the use of a long cylinder, wherein a long or double piston works; the top and bottom faces or surfaces of the piston are separated by a number of pillar stays or framed packing at least the length of the stroke, in order that the water, which works in one end of the cylinder, shall not by conduction cool the other end of the cylinder, where the other face of the piston is operated by steam, which is admitted through the top of the cylinder just before the piston arrives at its highest point. In the case of marine engines the water is admitted to one end of the cylinder from the sea, the disposition of the cylinder in the vessel being chosen as low as possible in order to avail of the greatest pressure. Two cylinders and packed double pistons are employed, the rods of which are coupled to a compound beam, which, when the invention is applied to locomotives, might be dispensed with and only one cylinder used, depending solely for motion upon the power of the steam to force the piston down in the cylinder, and relying upon

external atmospheric pressure for its return after a vacuum had been left behind it. This "atmosphydraulic steam engine" is intended to be general in its application.

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 18.—N° 132.

ATTWOOD, HENRY. — This invention relates to packing for steam engines, pumps, and machinery. Good hempen, flax, or cotton packing, combined with an india-rubber case, constitute an excellent efficient packing, free from friction, but hitherto practically of little value, as the greasy solution or compound in which the fibrous covering is steeped, quickly decomposes the india-rubber core. The object of the invention is to protect the core, by interposing between it and the greasy hempen or fibrous covering, a plaiting of tarred or prepared twine, or a veneer of cork or other suitable material, cut into strips and wound spirally round the core, and cemented with shellac or other suitable cohesive substance. The twine plaiting, saturated with 8 parts of tar, and 1 part of tallow is preferred. The compound with which the external hempen or fibrous covering is saturated, consists of 4 parts of tallow, and 1 part of French chalk. In order to give the required form to the packing, it is passed through rollers respectively grooved to correspond with the desired transverse section. Cork, which is not injuriously effected by greasy matter, may alone constitute the core.

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 20.—N° 150.

DE KERCADO, GEORGES THOMAS.—(*Provisional protection only.*)—This invention relates to a mode of using the power of steam, compressed air, water or gas, which, as described by the inventor, "consists essentially in directing or projecting the "motive power, whatever it may be, on to one or more plates. "To form a clear conception of my invention, suppose a boiler "filled with steam, and above it a sort of cup, into which the "steam may be conducted by a tube, and distributed alternately "and at will by a cock or by a valve; also suppose above this "cup a plate movable, but tied to this cup by rods, if the cock "or valve is opened, what will occur? evidently the plate, which "is above the cup, will be carried forward with considerable force,

"the force of the steam projected upon it. Now at one or two "yards distance, according to requirement, place a second cup "and a second plate, also above a reservoir of steam, and give to "this second apparatus the same movement as to the first, at an "interval of time more or less long, what will be the result "obtained? the same as by the first apparatus, that is to say, a "plate pushed foward, and the same plate pushed in a contrary "direction by a second plate, that is to say, a come-and-go motion, "a power which may be used by ordinary means for all sorts of "purposes."

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 21.—N° 159.

BROCKHURST, Henry and SULLIVAN, John.—This invention relating to pressure and vacuum gauges, consists 1, In making the curved tube which bears the strain (as the case may be) of either the pressure or vacuum, of a semi-circular or suitable form, arranged with one end fixed to the shoe at the bottom of the casing, and the other so that it shall not extend or be curved downward beyond the vertical line through the centre of the inlet pipe; to the upper free end an arm is attached to supply the place of the part usually bent down beyond the centre line, and to the extremity of this arm a toothed sector or crank, which communicates the motion of the tube to the index, is attached, whereby the motion is rendered more steady and accumulation of water prevented, for which purpose, 2, bent tubes of ordinary construction are filled with oil, or cotton wick soaked in oil, whereby freezing is prevented. 3. Instead of attaching the movement to the casing, it is fixed to a separate plate which is fastened to the shoe of the tube. 4. In order to prevent straining the tube out of form, by the admission of very high pressure, a small valve or self-acting cock is provided and so constructed, that when the steam pressure exceeds what the gauge is calculated to bear, the cock or valve will close and shut the steam off. In some cases the straining of the tube is prevented by fixing projections against the casing for the purpose of supporting the tube.

[Printed, 8*d*. Drawing.]

A.D. 1864, January 23.—N° 195.

WRIGHT, Robert Alfred and WRIGHT, Ernest.—This *invention* relates to apparatus for causing the consumption of

smoke, and promoting the combustion of fuel in furnaces. For this purpose the gaseous products of decomposed steam and water are employed. These gases are projected into furnaces through suitable nozzles or orifices, so arranged that the gaseous streams or jets issuing therefrom, shall cross each other and so be caused to spread over the surface of the fire. The nozzles or nipples may be severally set at different angles, or each nozzle may have two or more perforations relatively at an angle, each giving forth in a contrary direction, a separate jet. The decomposing apparatus consists of hollow discs, or a continous range of cylindrical or other formed pipes, disposed in the angles of the furnace or otherwise exposed to the heat. These pipes or hollow discs contain fragments of iron, zinc, pottery, or other suitable substances for facilitating decomposition. The apparatus is furnished with a safety valve, and may be disposed in the arch of the furnace, or it may be separately constructed contiguous to the furnace, into which its products could be conveyed. Air under pressure is sometimes used mingled with steam direct from the boiler; at other times the air is heated by causing it to pass through the decomposing apparatus, or through passages in the bridge, and induced or impelled by jets of steam from the boiler, it is projected into the furnace, where commingled with the steam, it is directed against the arch or lining, so as to come into contact with the flaming gases and other products of combustion, which are thereby consumed.

Various modifications, adapted to Cornish boilers, locomotives, marine boilers, and heating furnaces, are shown and described; these differ materially in the constructive arrangements and details with which other appliances are introduced.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, January 23.—N° 198.

NEWTON, William Edward.—(*A communication from Henry S. Lansdell, James O. Alter, and C. T. Francis.*)—This invention relates to that description of pump or fluid lifting apparatus which, after the fluid is raised by means of a partial vacuum being first formed in the pump chamber, maintains it and keeps up a constant flow and discharge of the fluid by the impulsive force of a jet of steam; no mechanism, valves, or other equivalent device being required. The form of the pump chamber, which is closed and surmounts the vertical suction pipe, may be spherical

or otherwise. Formed laterally in a direct line respectively at the opposite sides of the chamber, are two openings which receive two horizontal pipes; one of these pipes acts as the discharge pipe or pump spout, and the other, which is diametrically opposite, serves for the entrance of the steam. The end of this latter pipe projects more or less into the chamber direct towards the discharge pipe, which, as shown in the drawing of some of the modifications, it slightly enters, leaving an annular surrounding space for the water flow. The impulsive force of the jet of steam, which is thus directed into the discharge opening, first draws or drives out through the discharge spout the air contained in the chamber and suction pipe, and forms therein a partial vacuum by forcing back the atmospheric pressure, whereupon the water rises up the suction pipe into the pump chamber, and while the steam jet continues, flows out of the disharge pipe in a continuous stream.

[Printed, 8*d*. Drawing.]

A.D. 1864, January 23.—N° 199.

DIX, JOHN EDWARD.—This invention relates to the construction of furnaces and fire-places, applicable to steam boilers, and other purposes.

1st. Is an apparatus for the admission, heating, and diffusion, within the furnace, of separate currents or strata of air. This apparatus is affixed within the furnace door, and consists of a number of corrugated plates, horizontally disposed one above another, so as to form a series of separate undulating channels. These plates being within the furnace become heated. A panel in the door is fitted with a corresponding set of louver plates, which when partially or fully open (as may be required) form separate horizontal inclining entrances for the air, which becomes heated during its passage through the undulating channels, and is thoroughly diffused in the furnace, where mingling with the heated gases evolved by the fuel, inflammation takes place, and the visible and other products of combustion are consumed.

2nd. Relates to casting or otherwise forming furnace bars and fire-bed lumps, so as to provide for the passage through them into the furnace of currents of air, which enter from the ash-pit.

Four kinds of bars variously formed are shown and described.

[*Printed*, 1*s*. 4*d*. Drawings.]

A.D. 1864, January 25..—N° 214.

NEWTON, William Edward. — (*A communication from Alphonse Wackernie.*)—This invention relates to the supplementary application to steam engine or other governors, of an adjustable counterweight upon a lever, for the purpose of setting any fixed speed. The governor may be an ordinary ball governor, acting upon the valve lever through a connecting rod jointed to the end of a rocking lever, the other end of which is forked and embraces the sleeve on the governor spindle; near to the connecting rod at the outer end, another connecting rod is jointed to the lever, which communicates with the end of a horizontal graduated lever, the fixed fulcrum on which it oscillates being about the centre of its length; each end of this lever carries a link, wherein rest the ends of a screw, which extends underneath from end to end of of the lever. Upon this screw there is a travelling nut, to which a weight is suspended; the lever is furnished with an index, to the figures of which a pointer, attached to the travelling nut, is directed according to the required speed. The screw is operated by a hand wheel fixed upon its free end. When required to run at the normal speed the pointer is brought immediately under the fulcrum. The correct graduations of the scale are ascertained by experiment and then marked upon the index.

[Printed, 8*d*. Drawing.]

A.D. 1864, January 27.—N° 227.

YOUNG, James, and KIRK, Alexander Carnegie.—This invention relates to a mode of heating the air, which operates pneumatic engines, the heat of high-pressure steam derived by therefrom by conduction. The drawings exhibit two modes of applying the invention to "Stirling's air engine" in which an enclosed quantity of air is caused alternately to expand and contract in volume by a displacing piston, which shifts the air from the heated to the cooled end of the cylinder and vice versa. The arrangements consist of two displacing cylinders superposed above the engine; the upper ends of these cylinders are the heating or expanding, and the lower, the cooling or contracting ends. The displacing pistons are worked in the usual way by an eccentric on the main shaft. The steam at a sufficiently high temperature is applied in steam jackets, which are constructed to envelope the upper parts of the cylinders, around

is a groove or channel to receive the water of condensation, which runs off and is returned to the boiler. The heating metallic surfaces may be increased within a given area by corrugations or annular ridges. The cooling of the lower ends of the cylinder is effected by the constant flow of cold water. The piston is filled with non-heat-conducting material. In some heating arrangements a group or series of fluted or plain pipes, coiled or otherwise, are heated by steam internally; these heating tubes are placed within suitable casing to which the air is admitted.

[Printed, 8*d*. Drawing.]

A.D. 1864, January 27.—N° 228.

GEDGE, William Edward.—(*A communication from Alexander Gerin.*)—(*Letters patent void for want of final specification.*) — This invention relates to a rotary steam engine the arrangement of which consists of "a ring or crown frame" which "serves to secure the solidity and the fitting of the "entire arrangement of the machine, and it is on or in it "that are fitted or contrived the partitions, the cylinders and "other working parts. This crown or ring frame is divided into "sectors of equal length. The number of these sectors is "always double that of the cylinders and they are of two "denominations. First, sectors for entrance of steam, in which "sectors are the partitions or cylinder heads hereafter mentioned, "and which sectors for entrance of steam are always followed by "an escape sector; each entrance sector has a steam inlet. "Second, escape sectors, in which advance the cylinders in "working, and in which are also the steam escapements or outlets. Each sector for escape of steam is preceded by a sector "in which the steam enters. A driving wheel is placed on the "ring frame and receives and transmits the motion; it is "mounted on an axle and it is on its upper surface that the "pistons are fitted. The cylinders or receivers receive the steam "acting on the pistons; they form continuation of and adhere "to the movable partitions and comprise in length the length of "a sector. To facilitate the passage of the pistons the partitions "may be with valve slide wheel box or otherwise. The pistons "are fitted on the seat of the upper surface of the driving "wheel; they must be at rigourously equal distances apart and "in number always double that of the cylinders."

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 29.—Nº 247.

MAUDE, William Edward.—(*A communication from Nathan Thomas Edson.*)—This invention relates to steam engines and consists "in using a valve chest for a slide valve, and in regula-" ting the speed of the engine by connecting the stem of the " valve by means of a slotted lever to the eccentric rod and " governor, so that an increase of speed of the engine will pro-" duce a less movement of the valve and an increase expansive " use of steam, by which arrangement of valve much of the " usual friction of a slide valve and waste of steam in passing " from the valve to the cylinder is saved." "When the work to " be performed by the engine requires all its powers, the slide " of the eccentric will rest against the end of the slot of the " slotted lever nearest its pivot; the movement of the valve will " be sufficient to throw the ports wide open. On the speed of " the engine increasing, the governor acting on the angle lever " will move the eccentric rod out from the arm, and thereby " open the ports sufficiently wide only to keep up the speed of " engine. The crank, when up, revolving from the pivoted end " of the lever, will cause the supply ports to open when the " crank is on the centers, and to close at a shorter stroke as the " eccentric rod leaves the pivoted end of the lever;" "the slide " will move easily in the slot at the termination of the stroke of " the valve if acted on by the governor."

The invention also consists in the use of "an improved eccen-" tric yoke, by which steam is admitted equally at both ends of " the cylinder."

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1864, February 3.—Nº 288.

BEAMS, Thomas.—(*Provisional protection only.*)—This invention consists in forming the reversing gear of a steam engine in connection with only one eccentric instead of two. A link is made "which is curved internally to the radius lines which the " conecting rod of the slide valve requires on one side, and in the " centre of this link is a bar, and projecting theref haft, " which shaft constitutes the oscillating point " the sliding block which works within the li " connecting rod at the top of the link it

"motion, when at the bottom the backward or reverse motion, "but if placed in the centre no action takes place. To the "bottom of the link the eccentric rod is attached by a pin which "passes through a hole, and to this point is the first movement "by the eccentric on the crank shaft given. A lever and con-"necting bar is also attached to the connecting rod of the slide "valve to a bell crank, thence to the hand lever governing the "engine; this lever has a spring and ratchet for setting the "engine at a given speed backward or forward."

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 6.—N° 312.

RUNKEL, MARK.—This invention relates to the so constructing a steam engine as to be able to dispense with the connecting rod and crank. The engine consists of a cylinder fixed on a horizontal bed plate; upon the free end of the piston rod a sliding block is fixed, which works to and fro in suitable guides. Mounted upon a shaft disposed on the same plane as the centre of the piston rod and parallel therewith, is a metal cylinder or drum, on the surface of which there is recessed an oblique endless pathway, wherein slides the end of a cross pin, which is fixed through and projects from the piston slide block; this endless pathway extends round the drum, commencing at a turning point near to one end and inclining at an angle in half a revolution of the drum, to a returning point at the other end and then in the other half revolution returning to and uniting with the first starting or turning point; the longitudinal distance between the two points must correspond exactly with the length of the stroke of the piston. When the outward stroke commences, the end of the cross pin (then at the inward turning point) by pressing against one side of the oblique pathway, causes the drum during the outward stroke to revolve half a revolution; the pin has then reached the outward turning point, and during the inward stroke presses against the other side of the return pathway, and so completes the revolution of the drum, and each succeeding revolution is effected in the same manner by one to-and-forth stroke of the piston. Revolving motion is given off the drum shaft to actuate machinery and for general purposes. A fly-wheel is mounted on the shaft in order to insure uniformity of motion.

[Printed, 8*d*. Drawings.]

A.D. 1864, February 6.—N° 313.

LUPTON, BENJAMIN, WHITTAKER, SEPTIMUS, WHITTAKER, JOHN, and HARTLEY, ELIJAH.—(*Provisional protection only.*)—This invention relates to steam engines and is designed to cause the piston and rod to work rectilineally with the axis of the cylinder without the aid of the "radius motion or "guides" hitherto employed for the purpose. It consist "in the "employment and use of a pump or an auxiliary cylinder in "connection with the steam cylinder, and in such a position that "the piston (in the pump and cylinder) may be connected "together by a piston rod, the connecting rod being coupled to "the said piston rod at a point between the pump and the steam "cylinder, the arms of the connecting rod passing at each side "of the pump or auxiliary cylinder, by which arrangement a "parallel movement of the two pistons is insured, and the "'trunk' hitherto employed is dispensed with. It is to be "observed that in condensing engines the air pump may be "applied as above stated, in which instance the pump 'ram' "and the steam piston working in their respective cylinders, "together with the stuffing boxes, effect the parallel motion."

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 6.—N° 321.

FLETCHER, HENRY ALLASON. — This invention relates to the construction and working of locomotive engines and tenders, and is partly applicable to railway carriages and wagons. It "con-"sists in working the valve gearing of locomotive engines from "an axle of the engine other than the driving axle, the valve "gearing being either a modification of any of the forms usually "adopted, or it may be arranged and constructed in any other "suitable manner. It is also proposed in locomotive engines to "place the driving axle of the engine under the fire-box. In "forming the frames of locomotive engines, tenders, railway "carriages, or waggons according to this invention, it is pro-"posed to construct them each of two or plates of "metal placed a little distance apart, "by the 'horn plates' and the other "proposed so to construct locomotiv "to combine the same together in su

"shall carry the fuel, and the tender the water, or 'vice versa,' "or either of them shall carry only a portion of the water or fuel, "or both, and the other the remainder. In using or working "locomotive engines of the kind known as 'tank engines,' it is "proposed to unite or combine together two such engines, so "that both shall be under the control of one driver, and shall, in "fact, be worked as one engine."

[Printed, 1s. 2d. Drawings.]

A.D. 1864, February 6.—N° 324.

OAKLEY, John Thomas.—The object of this invention, which relates to vertical steam boilers and furnaces, is to obtain a large amount of heating surface, without complication of parts or unequal wear; also the superheating of the steam generated.

The steam generator consists of a vertical cylindrical shell with a convex top; an inner cylinder forms an annular water space at the base. The furnace, which extends below the base of the generator is shaped to the form of a frustum or truncated cone, and surrounded by a narrow water space, formed by an outer and an inner shell, and extending upwards a considerable height in the boiler, is covered in with a convex top. Between the furnace and the surrounding parts of the generator there is an annular flue space, with which the space in the crown of the furnace communicates by means of a circumposed series of angular flue pipes or bends. The upper ends of these bent pipes are set horizontally at regular intervals so as to radiate from the crown of the furnace, and their lower ends are set into the annular plate which covers the interspace or annular flue between the boiler and the furnace. The generator is entirely surrounded with brick flues; the flaming gases and products of combustion passing from the upper part of the furnace through the radiating series of flue pipes, descend into the annular flue, and after passing divergently under the base of the boiler section, rise externally in the brick flues up the sides, and passing convergently over the crown of the generator, enter the central chimney flue. The steam is contained in the space under the crown of the generator, and is dried and superheated by the heat in the surrounding flues, the steam space being inclosed by an iron casing, partly lined with brick, in order to protect the boiler plates which surround and form the steam space, from the injurious effects of extreme heat.

The fire-bars are hinged to the bearing bars, and a self-acting damper, operated by the expansion of mercury, is employed to regulate the fire draught.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, February 8.—N° 326.

SNOWDON, Thomas.—This invention relates to the cylinders of steam, and blowing engines, and consists,—

1st. In casting a portion of the cylinder to the cylinder cover, sufficient in depth to contain the piston at the end of the stroke, so that by the removal of the cover, the piston and packings may be examined, without disconnecting the working parts of the engine.

2nd. " Forming the steam and other ports in the said lids, and " in fitting an improved slide or equilibrium valve upon the " port connection, by which arrangement and improved valve " all the advantages of the ordinary flat side are obtained " (viz.), large areas of steam and exhaust ports, and at the " same time the rubbing surface on the face of the valve is " greatly diminished, and in addition to which the pressure in " the back of the slide is considerably relieved if not entirely " obviated by a loose jacket."

3rd. A cylindrical apparatus for surface condensing by means of currents of cold air. The cylindrical body of the apparatus is fitted with numerous tubes. A blowing apparatus sends a current of cold air through the tubes, and the exhaust steam from the engine is discharged amongst them. The water of condensation is returned to the boiler, and the air, heated during its passage through the tubes, is conveyed to the furnace.

4th. Places the air or blowing cylinder between two steam cylinders.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, February 9.—N° 347.

NEWTON, Alfred Vincent. — (*A communication from James Howell and David Birdsall.*) — (*Provisional protection only.*) — This invention relates to the securing of tubes in the tube sheets of steam boilers, condensers, and similar apparatus. The object of which is, " so to apply the tubes in the two corresponding tube

"sheets of a boiler, condenser, or other apparatus, as to provide "for their easy removal when necessary to repair or renew them. "The tubes are screwed into tapped taper holes in the two tube "sheets, the holes in one tube sheet being larger than those of "the other, and the corresponding ends of the tubes are enlarged "to fill the larger holes by means of taper thimbles which screw "on to the tubes and into the latter holes, and it is in such "enlargement of the tubes by the application of internally and "externally tapped thimbles that the first part of the invention "consists." 2, "relates to the tapping of the female screw "threads in the holes of the tube sheets. Its object is to provide "for the tapping simultaneously of two opposite holes in two "corresponding tube sheets in such a manner that the threads in "the said tubes shall be true to a common axis. To this end a "tap with two heads is provided, one or both of which are made "adjustable lengthwise of the shaft of the tap to bring them at "the requisite distance apart. The shaft of the tap is provided "at its extremities with squared or flattened faces for the recep-"tion of two wrenches, which are applied one at or near each "head outside of the two tube sheets, in order that in the tapping "of the two holes simultaneously the shaft may not be subject to "torsion."

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 11.—N° 364.

SLACK, JAMES.—(*Provisional protection only.*)—This invention relates to the filtration of feed water, and to the formation of filter tanks. The interior lining of these tanks is composed of metal, glass, earthenware, or other material for the inner casings, in combination vith wood for the outside. The form of the tank is by preference rectangular, but any shape may be adopted. The inside is divided by a vertical partition, which nearly reaches to the bottom. One of the sections formed by the partition is the clear water tank; the other is filled with a filtering medium, composed of ground glass, coarse sand or gravel, pulverized stone, fine or silver sand, furnace coke, and vegetable and animal charcoal, severally disposed in layers or strata. This forms the filtering bed, which rests upon a perforated plate near the bottom of the filtering compartment, and as each stratum is spread upon the preceding it is beaten down until it becomes a tolerably solid

mass, the coarse gravel sand or ground glass, forming the lower and top strata, above which is placed another finely perforated plate, secured by bolts or cement. Marine or other water may be admitted either above or below the filtering bed. The invention may be adapted to marine and other condensers, so as to cause the feed water, or the water of condensation, before entering or re-entering the boiler, to pass through the filtering medium.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 12.—N° 370.

WINSTANSLEY, WILLIAM, and KELLY, JOSEPH.—This is an invention of steam apparatus, for use on shipboard to work pumps and fire engines, discharge cargo, lift anchors, hoist sails, set up top masts, haul the ship, do all the heavy work on deck, and produce fresh water pure and sparkling from sea or other water. Upon the deck of the ship, mounted upon a water supply tank, is a vertical boiler with central furnace, and an ash-pit which is formed in the tank, so that a water space comes between it and the deck. The upper part of the furnace is composed of a series of annular dished plates or shallow cones, placed and rivetted together alternately face to face and back to back, so as to form a series of chambers, through which in succession the hot draught passes upward to the chimney. The boiler is furnished with the usual appliances of safety valve, gauges, and cocks. The engine, either oscillating or otherwise, is mounted on wrought-iron brackets attached to the boiler, and modifications are described of the methods employed for working the steam valve. The feed pump is placed in the tank below the surface of the water, which is kept in a heated state. The engine crank shaft, by the aid of gearing, actuates the driving shaft, which passes into the deck house, and by means of rope pulleys, conical drums, and other appliances, imparts motion to the windlasses, hoisting apparatus, and the other suitable gear employed and described for performing the various operations required.

The "improved evaporator or regenerative still" consists of a hollow base or plinth, which contains the cistern wherein the filtering composition is deposited. A cylindrical case, enclosing one or more close spiral coils or tubular worms, is employed for

boiling, condensing, aerating, and circulating the water of condensation; and fixed on the top of the cylindrical case, in connection with a steam pipe from the boiler, is a modification of "Giffard's injector." The filtering medium consists of separate layers, commencing at the bottom and resting on a perforated plate, first a layer of coarse gravel or ground glass, and in succession, layers of well washed white sea or river sand, finely ground furnace coke, and at top another layer of coarse gravel or ground glass. Each layer is well beaten down, so as to consolidate the whole and form a perfectly solid mass, whereon, bolted or cemented down, is placed another perforated plate. The water, condensed from steam generated at a low temperature, is admitted to the top of the filter, percolates through the filter bed, and is drawn off in a pure state below.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1864, February 13.—N° 381.

FINCH, Gerard.—(*Provisional protection only.*)—This invention relates to the application of steam or other fluid pressure for the production of direct rotary motion, by causing the circumgyration of a piston within an annular passage or piston way, concentrically formed in an annular casing which surrounds a central axis. The transverse sectional form of the piston way may be rectangular or otherwise, the configuration of the piston corresponding therewith, so that it fits and slides round the annular way in steam-tight contact on all sides. Fixed upon the central shaft or axis there is a plain wheel, the rim of which is fitted to fill and work in an annular groove cut through the inner side of the casing, so that the periphery of the wheel is level with the inner surface of the annular piston way, and to the periphery of the wheel the piston is securely fixed. Outside the casing are two slide boxes disposed diametrically on opposite sides of the centre, and opening into the annular piston way; these boxes contain slides which move radially across the piston way, and are by turns withdrawn to allow the piston to pass, and immediately afterwards are by turns projected across the way so as transversely to divide it. These slides resist the backward pressure of the steam, which is by means of suitable valves admitted into the divisions of the piston way in succession at the after side of each slide, so as to follow and force the piston round from each

slide half a revolution, the exhaust taking place through suitable openings out of the casing in front of the slides, so soon as the latter are projected across and in succession close the annular way. In this manner the piston is driven round the annular passage, and by means of its connection to the rim of the wheel, the axis whereon the latter is mounted is caused to rotate, and will give off motive power.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 16.—N° 400.

JOYCE, ARTHUR JOHN.—(*Provisional protection only.*)—This invention relates to steam engines, and has for its object the prevention of vibration in such engines and also of the buildings wherein they are contained. This is accomplished by balancing the cranks and the to-and-forth pull and thrust of the piston. Four cylinders disposed so as to work on to four separate throws formed at right angles to each other on the crank shaft, are set respectively in relation to each other at angles of 90° or if four cylinders acting as two pairs be employed, each pair is set in relation to the other at an angle of 90° to work respectively on to two cranks diametrally formed on the plane of the shaft. The last arrangement is preferred.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 18.—N° 419.

TRAVIS, JOHN.—This invention, for preserving the metal of and preventing corrosion in steam boilers and generators, consists in the use of sea weed, called carrigeen or Irish moss, kelp, or any other sea weed possessing the like properties. The moss, either in its natural state, ground, or in decoction, is put into the boiler at the manhole, or into a box fixed on the feed pipe or tank whence the boiler is supplied, at the rate of 12 lbs. of moss per week, for every thirty-five or forty horse power, more or less, according to the previous state of the boiler. Kelp in its natural state, ground or in decoction, may be used alone or compounded with the moss, but preference is given to the moss alone and its daily use recommended at the rate of about two pounds per day, whereby the water is kept constantly and equably medicated. Boilers are to be blown off and washed out as usual.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 19.—N° 434.

JONES, WRIGHT.—(*Provisional protection only*).—This invention relates to steam-engine governors and regulators of that description wherein air or other similar fluid is employed to act upon the steam or throttle valve. It consists of a chamber formed with elastic or flexible sides attached to top and bottom plates; this chamber is divided into three compartments by two diaphragms; the lowest partition or diaphragm is attached by rods to a crank which imparts to it a constant up-and-down movement; the compartments communicate with each other through air valves, which open upwards through the diaphragms; there is also an admission valve through the bottom plate. The working of the lower diaphragm (after the manner of a smith's bellows) forces the air into the upper compartment until a fixed pressure is obtained therein, and the top plate raised thereby, between which and the throttle valve by means of rods and levers there is a mechanical connection. When the engine is working at the regulated speed, the pressure in the compartments is equalized, and the top plate maintains its normal level, but if the speed increases beyond, extra inflation takes place, which raises the top plate and by means of its connection with the valve, causes more or less a partial closing of the latter and thereby shuts off the proportionate quantity of steam. The contrary effect is produced when the top plate for want of inflation sinks below the regulated point; the changes in the position of the valve are indicated on a dial attached to the apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 20.—N° 439.

ALLEN, EDWARD ELLIS.—This invention, relating to locomotive and portable engines, consists 1, in the construction of the cylinder, which is made double the ordinary length and divided by an internal transverse partition into two equal lengths; in each half there is an ordinary piston; these pistons are united by a trunk, which works through the partition. Steam is admitted to the pistons alternately in the annular spaces round the trunk on each side of the partition, and thence exhausting alternately into the ends of the cylinder respectively, where it has the whole area of the piston to act upon, expanding in the ratio of the capacity

of the annular space to the whole cylinder, and can be cut off from the annular space at any part of the stroke, either by lap on the valve or by link motion. When great economy of space is required, the trunk may be utilized as a cylinder, to be operated by a motionless piston. Modifications of this part of the invention are described. 2. Relates to the valves of double expansive trunk engines. The annular space and the other end of the cylinder communicate through the piston by means of valves, which may be opened and closed by the motion of the piston, by means of projecting studs, acting alternately against the sides of the division plate and the cylinder ends. 3. Consists in forming a steam case upon the boilers of portable engines for the purpose of enclosing the cylinder and valve chest, free communication by means of holes through the shell being open with the boiler. In some cases simply a casing encloses the cylinder. 4. Consists in preventing loss of heat and condensation, by adding to the single trunk engine a trunk casing, into which the trunk attached to the piston works to and forth. This casing may be formed in one casting with the cylinder, or bolted on the cover. 5. Consists in fitting to locomotive and portable engines, atmospheric condensers, formed by preference of very small copper or brass tubules, fitted into plates of hard wood or metal. The course of the exhaust steam is amongst the tubes in the spaces between them. A rapid current of cold air is induced through the tubes, which (excepting the air passage from the condenser) forms the only air channel to the ashpit, which is otherwise closed. In some cases the air may pass amongst the tubes, and the steam through them; the water of condensation is returned to the boiler. 6. Consists in the use of hollow rivets for uniting the links of traction chains, and 7. Consists in attaching to portable engines, charcoal filters formed of cylindrical or other shaped blocks, conveniently arranged and fixed upon perforated tubes, which unite in a central main pipe connected with the pump or injector.

[Printed, 1*s*. Drawing.]

A.D. 1864, February 22.—N° 440.

GERSTENBERGER, Johann.—(*Provisional protection only.*)—This invention consists of an apparatus for condensing and utilizing the heat of steam. Two or more cylinders are used, each concentrically enclosing a smaller cylinder, the annular space

between being left for water. Two cylinders are described, they are conveniently disposed in a horizontal position. The annular spaces being filled with cold water, the steam to be condensed is passed through the internal cylinder of the first and thence by means of a connecting pipe, through the interior of the second; the water of condensation flows off through a suitable pipe to a pump, which forces it back into the annular water space of the second cylinder and thence by a pipe into the water space of the first, whereto another pipe is fitted, which communicates with the boiler, into which the water finally flows. The portion of steam uncondensed is carried off by a pipe to a pump, which takes up from a reservoir provided for the purpose a small quantity of cold water and so completes the condensation; the resultant water is either retained for feeding the boiler or allowed to run to waste. When more than two cylinders are used, they may be connected in a continuous series. Cylinders of small diameter and great length are preferred. They may be formed of three concentric cylinders, so as to leave two annular spaces within each, one for cold water and the other for steam. The apparatus may be used for regenerating steam.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 23.—N° 458.

ROWAN, William.—This invention relates to a new arrangement of the parts of steam engines, the object of which is to obtain an increased speed of piston, cut off the steam early, and work it at a pressure of two or three atmospheres. The motion of the working parts is produced as in ordinary beam engines. The example shown and described comprises an upright cylinder of unusual length; the piston rod head is jointed to one end of the beam, which is constructed with two wrought-iron side plates. The other extremity of the beam is jointed to and supported by a pair of columns, which oscillate on trunnions at their lower ends. The parallel motion is obtained by means of two radius bars, the fixed ends of which centre on strong studs, supported by standards which rest on each side the top of the cylinder, and are supported by diagonal stays; the free ends of the radius rods are jointed to a strong cross bar, which projects laterally from each side the centre of the beam, to which also the air-pump rod is attached; the feed-pump rod is attached to the beam near to its outer end.

The beam has a double motion, the up-and-down with the reciprocations of the piston rod, combined with a longitudinal movement required to follow the vertical action of the rod, which the oscillating columns permit in accordance with the controlling motions of the radius rods. The connecting rod is jointed to the beam at a point, about two-fifths of its length from the piston head. The lower end of the connecting rod is coupled to the crank below. The other parts of the engine are of the ordinary description.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1864, February 29.—N° 494.

BARWELL, Henry.—This invention relates to a portable steam generating apparatus, which may be of any convenient form. The drawing exhibits a vertical cylindrical shell, covered with wood to prevent the radiation of heat. The furnace is concentrically disposed and is surrounded with water space; the chimney springs from the crown of the furnace and passes up through the steam space and through an upper feed water compartment to a suitable height above. The steam is taken from the upper part of the steam space by a tube, which enters through the casing. This tube is bent upwards and over the top of the boiler towards the chimney, into which it enters and passes downward towards the furnace in spiral coils; it is then turned upwards, passes out through the opposite side of the chimney to a convenient length and terminates with a cock and nozzle, whereto the steam distributing tubes which are generally of a flexible kind (when steam is applied to flower and fruit beds) are attached. In order to facilitate its removal from place to place, the boiler is fitted with a pair of trunnions, whereby when required, it can be mounted upon wheels; it is also furnished with side handles and legs. Safety and vacuum valves are fitted to the apparatus, also a water gauge, blow-off cock, steam whistle, and alarm plug.

[Printed, 6*d*. Drawing.]

A.D. 1864, February 29.—N° 502.

SOUTHAM, William. — (*Provisional protection only.*)—This invention relates to that class of rotary engine in which the force of the steam is directed against the blades of a wheel, mounted within a case upon an axis or shaft, which is thereby caused to rotate. Two or more of such wheels, each in a separate case,

are mounted on a tubular shaft; the impulse of a continuous current of steam at its full pressure is directed at a suitable angle upon the blades or paddles of the first wheel, whence after striking the blades, it passes through converging passages and through the axis, into the case of the second wheel, where having operated in the same manner upon the blades, it passes on through similar converging channels to act upon the blades successively of the other wheels in the series, the last of which communicates with a condenser case, wherein is mounted a rotary fan, for the purpose of directing a cold current of air upon the steam, which is thereby condensed and a vacuum formed. The passage of the steam from the boiler steam pipe to the first wheel and thence to the others and finally to the condenser, is through the hollow axis, stops or valves being provided to give into each wheel in succession the necessary lateral direction to the steam. Ordinary condensers may be employed.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 1.—N° 509.

RICKETT, THOMAS.—(*Provisional protection only.*)—This invention of a steam generator, consists of a series of vertical water tubes, ranged side by side in one or more straight or curved rows or sets, and fitted at their lower ends into a tube plate which covers a water space or chamber. The tubes are held in the tube plate by an eye-bolt and cross-pin, which is tightened up against an internal flange, forged on the lower end of each tube; each bolt passes through the water space and is drawn up by a nut outside, so that any one tube may be removed without disturbing the others; the upper ends of the tubes, are fitted with small bent pipes which open into a steam chamber above. The tubes are so arranged that the flaming gases and hot draughts pass between them on their way to the smoke box. Each tube has full liberty to expand and contract. It is proposed to shield the steam chamber from the fierce heat of the fire by a fire-brick arch, or by placing "baffle plates" underneath. It is also proposed to place retorts underneath as a protection, which may also be used for the purpose of making gas. According to a modification, instead of a water chamber and tube plate, the lower ends of the vertical tubes are fitted into sockets formed on the upper surface of horizontal tubes of larger diameter.

[*Printed*, 4*d*. No Drawings.]

A.D. 1864, March 2.—N° 525. (* *)

PEARSON, John.—(*Provisional protection not allowed.*)—"The "employment of a blast for heating steam boilers, and for such "other purposes as the same may be applicable thereto." The air is supplied to the fire "by means of a fan or bellows, or "equivalent contrivances," thus obviating the necessity of large "or tall chimneys."

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 5.—N° 559.

BEATTIE, William George.—This invention relates to improvements in locomotive engines, and consists, 1. In placing within the smoke box, of the engine, one or more rows of tubes, communicating at each end with chambers placed at the sides of the smoke box, and so connected with the boiler, the pumps or injectors, and the tank, that the feed water before entering the boiler, shall pass through the tubes, and the heated gases between and amongst them as they course on from the furnace to the chimney. The tubes being arranged in rows across the smoke box a moderate distance apart, prevent the passage of sparks and ashes, at the same time that the feed water is heated. 2. Placing an inverted coniform funnel around the blast pipe attached to the chimney; this funnel is constructed of plate iron and perforated with apertures sufficiently small to prevent the passing of ashes or sparks. Instead of perforated plate iron, the funnel may be constructed of wire or metal strips. 3. Checking or baffling the direct passage up the chimney of the gases, and stopping the flight of ashes and sparks, by placing in the smoke box, plates of cast iron a certain distance apart and so arranged that an indirect course is given to the hot draughts. 4. Placing in the smoke box, for the same purpose, a grating or strainer formed of angle iron disposed in rows and alternately inverted. 5. Forming a strainer, for a similar purpose, with two perforated movable plates, disposed in the smoke box a slight distance apart, and so connected as to be under the control of the engineer, who by bringing the plates relatively into certain positions, can either baffle the gases, open a free passage, or entirely check the draught. 6. Relates to an improved form of damper, wherewith to open the ash pan to the cold air draught, and guide the ashes to fall therein instead of falling upon the road.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, March 7.—N° 567.

NEWTON, Alfred Vincent.—(*A communication from Benjamin Lathrop.*)—(*Provisional protection only.*) — This invention relating to apparatus for heating the feed water of steam boilers, consists in applying to a steam engine cylinder, two or more heater exhaust valves in addition to the ordinary exhaust arranged in such manner in relation thereto, and to the ordinary steam piston, that the heater exhaust will open with the usual lead of the exhaust valve into the condenser, the condenser exhaust dwelling so long a time as the economical working of the engine will determine. A portion of the exhaust steam passes into the heater, raising the temperature of the feed water to nearly boiling point, or from 100° to 120° above the usual temperature of the water in the hot well, offering no obstruction to the motion of the piston or to the correct operations of the engine; by connecting the lower part of the steam chamber in the heater with the force pump, the water of condensation contained in the heater is supplied to the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 8.—N° 574.

LAWRENCE, John.—(*Provisional protection only.*)—This invention consists in the application of a steam whistle or audible signal apparatus to steam boilers, whereby when the water sinks to a certain level, the deficiency is signalized to the attendant and to other persons in the vicinity. The whistle may, by means of a tube in communication with the boiler, be placed at a distance therefrom to warn particular persons. A long horizontal lever, with a float at one end, and a counter-balance weight at the other, is mounted within the boiler upon a suitably fixed fulcrum; on this lever a valve, opening to the whistle tube, is connected to the end; whilst the water is maintained at a safe level, the float causes an upward pressure on the valve, which is thereby kept close against its seating, but whenever, in consequence of a deficiency of water, the float sinks, the valve is drawn down and opened, thereby allowing the steam to escape to the whistle which immediately gives the necessary signal.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 9.—N° 585.

BRODIE, David.—(*Letters patent void for want of final specification.*)—This invention relates to heating water by waste steam, which as applied to a high-pressure steam engine, prevents "any appreciable back pressure." The exhaust steam is discharged into a closed chamber, against one side of a closely perforated vertical or inclined diaphragm; the water to be heated is introduced so as to run down the other side of the diaphragm. The force of the steam through the diaphragm, throws the water upon a series of inclining shelves disposed on the far side of the chamber; thence running forward to the edges of the shelves, it falls, and is again projected amongst the steam. In this manner the water is repeatedly brought into contact with and takes up the heat contained in the steam, which is thereby condensed, the products passing off by a pipe from the bottom of the chamber. Two valves are fitted to the chamber, respectively for the admission of air, and relieving pressure.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 9.—N° 590.

HUTCHINSON, William.—(*Provisional protection only.*)—This invention relates 1, to obtaining parallel motion in steam engines by the application, between two cylinders, of a fixed wheel with internal teeth, which engage with a pinion carried round by a crank; to this pinion the piston rod is connected, and as the pinion rolls round the internal gearing of the wheel, the required parallel motion is obtained. The cylinders may both be steam cylinders, or one may be employed with steam and the other as an air, force, or lifting pump. 2, Relates to certain modes of constructing the above parallel motion, consisting 1, in making the cylinder cover or covers in one with the part which carries the internal geared wheel and crank pedestal, including the foundation plate; and 2, forming a flange upon the pinion and casting the crank pin thereon. 3, Forming the central crank pin conical with the smaller part of the journal next the crank. 4, Making the mounting cap of the piston rod with a double adjustment, for the purpose of applying it to two steam or other cylinders. 5, Making the centre steps of the crank pin in two parts bored conical. 6, Fitting the central stationary wheel with a loose cap provided

with snugs to prevent the wheel revolving; adjusting screws may be used for this purpose. 7, Furnishing the crank-pin with a block and slide to steady its movement.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 10.—N° 605.

CLAYTON, JOHN.—This invention relates to the construction of reverberatory furnaces, and to employing the heated gases and products of combustion therefrom for the purpose of generating steam in a vertical boiler. The bed of the furnace is so constructed as to be capable of rotating on a horizontal plane, in order that the piles, ingots, or masses of iron or steel contained in the furnace, may by turns be brought to those parts of the furnace where the greatest heat prevails. The bed turns upon a vertical centre, motion being imparted to it by means of bevel gearing. It may rest upon wheels which traverse an annular rail. When the furnace is employed for melting, the bed is made hollow, and may either be tapped in its ordinary position, or it may be so constructed as to be capable of removal on rails, and tapped contiguous to the moulds.

The vertical boiler is placed at the back when one furnace is employed, or between two furnaces. It forms a cylindrical casing to the main furnace flue, which after passing through the boiler, communicates with the chimney, which together with the boiler is supported on columns. The furnace draught is regulated by a damper mounted on the top of the chimney or stack, and operated by a chain.

The furnace may be heated either by burning solid fuel in the ordinary way, or by the combustion of gaseous compounds, and jets of steam may be introduced. The arrangements are to be modified in accordance with the requirements of the various processes to which it may be applied.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1864, March 10.—N° 611.

PENRICE, HERBERT NEWTON.—This is an invention relating to machinery for tunnelling, and driving galleries through rock and other strata, such machinery being actuated by and combined with a steam engine and boiler, as proposed by this inventor in the specification of a former patent, dated June 3, 1861, N° 1386.

The fore parts of the engine and machinery, and the front end of the machine are supported on two feet, which are adjusted by wedges and screws, and slide along the lower surface of the tunnel when the machinery is moved forward. The after parts of the machine and the boiler are, as formerly, supported on wheels, an additional pair of driving wheels being interposed between the working section of the apparatus and the boiler. Instead of using bevel wheels, more direct advancing action is obtained by worm wheels fixed on the supporting wheel axis, and worms on shafts actuated by the engine. The tires of the driving wheels are furnished with projections, and are shaped to correspond with the configuration of the opening or tunnel. The main steam valves are worked by a small cylinder and piston, which also works the driving gear for advancing the machine to its operating position as the work progresses. In some cases, when an enlargement in the size of the tunnel made by the machinery is required, the apparatus is fitted with drilling gear, for perforating the rock when blasting is necessary. The steam boiler is felted, and inclosed by a jacket for the purpose of absorbing the heat, by surrounding the boiler with a continuous current of cold water, which is allowed to overflow. The ash-pit is closed, and the air for supplying the fire, is arranged to be drawn from the front of the machinery at the face of the work, so as to answer the purposes of ventilation, the draught through the chimney flue which carries off the exhaust steam being hastened by a fan. The details of the operating machinery are not described.

Instead of steam, compressed air may be employed to actuate the machine.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1864, March 14.—Nº 643.

ROWING, Esau.—This invention, relating to the construction of high-pressure steam boilers or generators, consists of a brick or otherwise built furnace containing the fire at one end; it is a low arched longitudinal chamber in connection with a chimney flue; at the back end within the furnace chamber is transversely disposed a main horizontal cylindrical tube one-half filled with water, the established working water level. The front of this tube is on the plane of its centre made considerably thicker than the other parts, in order to receive the screwed ends of a close longitudinal

series of generating tubes, which enter the front side of the horizontal tube on a level with the water line; this series of tubes, slightly inclining downwards to the extent of one-half their diameter in their whole length, is disposed close to the arched roof of the furnace and extends the whole length of the furnace beyond the front, passing out through the front wall, where the tubes are closed by removable flanges for the convenience of cleaning out. The ends of the main tube pass out through the side walls of the furnace and are closed by flanges and covers bolted to; one end projects further out than the other for the purpose of attaching thereto the water and steam gauges, also the safety valve at top and the blow-off cock at bottom. The upper half of the main tube is the steam space whereto the steam pipe, which passes out through the roof of the furnace chamber, is connected. The front ends of the generating tubes are by reason of their downward inclination filled with water, the other ends are half full, so that the space for the passage of the steam into the main tube gradually increases to one-half their area.

[Printed, 8*d*. Drawing.]

A.D. 1864, March 15.—N° 655.

EMPSON, James, and VON HARTZ, Heinrich.—This invention relates to rotary steam engines. "The cylinder is made in "two halves, each of which is turned inside to a template, so "so as to be exact counterparts of each other, and then the two "halves are fixed together with accuracy. In the interior of the "cylinder there is a central plate or disc acting as an arm, and "forming a central boss, which is fitted conically into glands con-"nected to both sides of the cylinder. The arm extends to the "piston part of the cylinder, and works between two rings pro-"vided with springs. The piston is fixed to the arm and works "in a circular space or bore at the outer circumference of the "cylinder. The boss of the arm has an oblong hole, into which "is loosely fitted the main shaft of the engine, so that there shall "be no friction on the arm and gland. In the bore of the cylin-"der in which the piston works there is a space to which is fitted "a stop slide, one side of which works close to the rings at the "side of the arm. The slide is enclosed in a box or case having "a stuffing box, and to the outer end of the slide rod is connected "a roller, which is placed in an elliptic or cam groove cut or

"formed in a drum fixed to the main shaft, so that as the drum "revolves the slide shall move out to allow the traverse of the "piston, and then close up quickly. When there is a double "engine having two cylinders, the grooved drum is placed "between, and the grooves arranged accordingly. For regulating "the supply and exhaust of the cylinder there is a slide valve "worked by a loose eccentric on the main shaft, there being "stops for working the engine forwards or backwards, and air "pumps, feed pumps, and other apparatus can be worked by "eccentrics on the main shaft or otherwise."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1864, March 16.—N° 671.

LONGRIDGE, William Smith.—This invention, relating to the construction of steam boilers, and applicable to other purposes, consists 1, in the use and manufacture of broad hoops and flat rings, and other desired shapes formed without rivetted or bolted seams, by continuous or endless metal. In the manufacture of boilers and cylindrical vessels, the use of flat rectangular plates is dispensed with, and a series of cylindrical hoops, made to the required size and diameter, are united together, by annular rivetted joints, to form the cylindrical parts. The hoops, rings, or other continuous forms, are made at the time of manufacturing the iron, by preparing hollow ingots or blooms with coiled bars of metal, so arranged as to break joint in the coil, which is finished or built up hollow and circular; the bloom so prepared is then subjected to the heating process, and when at a proper heat, is pressed, hammered, or rolled so as to effect the complete welding of the mass, which at this stage of the process is in the form of a short thick tube; it is afterwards submitted to the rolling process (preference being given to the rolling machinery described in the specification of a patent granted to this inventor and dated December 19th 1862, No. 3397) whereby the bloom ultimately takes the form of a cylindrical hoop or ring of the required size, sufficient metal for the purpose having been piled and welded in the bloom. 2, consists of the application of the heat derived from jets of gas, ignited and so arranged, that the flame shall impinge upon the surface of the metallic cylinder, hoop, or ring, during the process of rolling, and when not required be easy of removal.

[Printed, 4*d.* No Drawings.]

A.D. 1864, March 16.—N° 672.

BATEMAN, Hyde.—This invention relates to rotary engines, in which a hollow rotating piston of a peculiar construction is employed, through an opening on one or other side of which, according to the direction of rotation, the exhaust steam passes off to a condenser or into the atmosphere. Sliding diaphragms, which stop or resist the steam, are fitted with valves on each face, through which the steam is admitted; these moving diaphragms, which communicate internally with the steam supply, slide up and down in guides, actuated by an eccentric cam or other suitable device, adjusted to raise the diaphragm stops at the proper time for allowing the piston to pass in its annular course round its cylindrical path, which is formed in two halves bolted together, each half containing an annular semi-circular groove which, when the two halves are coupled together, form a hollow ring the section of which is a perfect circle, in which the periphery of the piston is suitably formed to fit and circularly slide. There are two sets of valves and reversing gear, so that the engine may be worked in either direction. Before the sliding diaphragms are raised, in order to avoid friction, the steam pressure on each side is equalized. The piston is connected to a central boss, which is keyed fast upon the main axis, causing the latter to revolve therewith. If applied to a locomotive engine, the wheels would be fixed on the main axis, or in the case of paddle wheel vessels, the ends of the main axis would carry the paddle wheels.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1864, March 18.—N° 696.

BURRELL, James.—This invention relates to a self-acting scum or brine and feed cock for marine steam boilers; it may also be used as a salinometer, and water gauge. A vessel is employed divided by a vertical partition into two compartments or chambers of unequal size, and closed at top by a lid; both chambers are, by suitably bent pipes, connected to the boiler below the water level. The largest chamber is in communication with the boiler, whence the brine or salt water, by means of a second pipe near the water level, is kept in circulation; the smaller chamber contains distilled water which, by reason of its specific gravity being lighter, does not mix with the brine. In each chamber there is a hollow tubular float, weighted to sink below the surface. By upright

rods fixed to the top of these floats, they are jointed to the opposite ends of a horizontal lever, the fulcrum of which is a stud, which has liberty to move up and down in a fixed slot, in accordance with the rise and fall of the water. The lever is furnished with a third or pendant arm in the form of a T, which, as the inclination of the lever is changed by the relative position of the two floats according as the specific gravity of the brine increases and diminishes, is made to operate the scum cock by means of an adjustable connection. A pipe leading from the boiler to a tank or vessel, superposed above the distilled water chamber, acts as a condenser and keeps the chamber supplied with water. A second float, of the ordinary kind, is disposed in the brine chamber in connection with the feed cock, which regulates the supply to the boiler. Glass plates are fixed in front of the vessel opposite the rod of each float, wherethrough, the height and relative levels of the water in the chambers can be observed.

[Printed, 10*d*. Drawing.]

A.D. 1864, March 21.—N° 706.

MARTIN, William Arena, and WYLAM, Edward.—This invention relates to the construction of fire or furnace-bars, applicable to the furnaces of steam boilers, and such-like uses.

These bars are severally made in two parts, the upper or wearing part whereon the burning fuel rests, is made of wrought iron or steel, and the lower or bearing portion of cast or wrought iron, the two parts being firmly attached to each other by means of lugs or straps, or by side pieces, so as to form along the top of the lower part a shallow groove wherein the upper part of the bar rests. Either part of the bar may be removed, and replaced by a new piece without the necessity for removing and casting aside both portions of the bar. By means of suitable arrangements beneath the range of bars, a rocking motion is imparted to the bars severally, and the range of bars is so mounted on a transverse central supporting bar, that when required, the whole range may be made to trip or tilt, so as to deliver the contents of the furnace at the bottom of the ash-pit. Letters Patent bearing date September 28, 1860, No. 2351, are referred to.

[Printed, 8*d*. Drawing.]

A.D. 1864, March 22.—N° 721.

LESLIE, John.—This invention relates to apparatus applicable to the purpose of burning hydrocarbons, so as advantageously

to generate heat for evaporating fluids in steam boilers and vessels, and for other uses. "A number of shallow trays or vessels are "arranged one over the other. Above each tray or vessel there is "a narrow air passage to admit of a free flow of atmospheric air "over the fluid contained in each tray or vessel. These trays or "vessels are enclosed in and are at the front end of a flue or "chamber, the construction and arrangement of which will "depend on the purpose to which the heat is to be applied. "Beyond these trays or vessels, and parallel therewith, are a "series of tubes or passages, the open ends of which pass out "through the sides of the chamber or flue in order that atmos-"pheric air may flow freely into such tubes or passages and away "from them through longitudinal slits or openings into the "chamber or flue. These tubes or passages are placed one above "the other, and there is a narrow passage between each pair of "them through which the flames coming from the trays or vessels "pass. A supply of hydrocarbon is to be kept up in each tray or "shallow vessel which is to be lighted. The effect of this arrange-"ment is, that atmospheric air rushes over the ignited fuel in the "trays or vessels. The flames thus produced act on the tubes or "tubular passages, which become highly heated. Atmospheric "air is thus caused to flow into the tubes or tubular passages, "and becomes highly heated before it passes out from the slits or "outlets. In some cases a fan or other apparatus is employed to "put the air in motion. The heated air thus obtained combines "with the flames" which may be directed over the heating surfaces of steam boilers and other vessels.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 22.—N° 725.

HOWE, William.—This invention of improvements in motive-power engines, relates to a mode of constructing the slide valves, so as to relieve them from back pressure, without materially increasing the frictional surface. It proposes to apply two slides back to back working over double ports, each set of ports being one half the required area. On the back of each slide valve, it is proposed to cast a cylindrical projection; these projections are to be halved into each other and accurately fitted together; a semi-circular recess is sunk in the back of the valves, each corresponding with the other, so as to receive an india-rubber or metallic hoop.

The frame in connection with the valve spindle, must be accurately bored to fit the cylindrical projections and enclose the hoop. Instead of the projections the valves may be placed back to back with a plain butt joint, allowing room for expansion. It is proposed that a free open passage be made through the back of the valves, for the escape of leakage into the exhaust pipe, which passage may be so increased as to answer for the exhaust. The re-action of a spiral or other spring placed in the projections at the back between the valves, may be used to keep the valves against their seatings, should any derangement occur by water or otherwise, to prevent which, a relieving valve may be fitted on each end of the cylinder. The two valves may be cast together, and the surfaces slightly inclined to ensure tightness, or, an adjustable wedge may be fitted between the two valves, instead of the cylindrical projections.

[Printed, 6*d*. Drawing.]

A.D. 1864, March 23.—N° 732.

MOREL, Augustin.—This invention relates to traction engines; it is supplementary to a prior patented invention by this inventor, which bears date June 19, 1863, No. 1538, and consists 1, in adding to the arrangement of the engine described in the specification of the said former patent, a second engine mounted behind the main engine; it is provided with ordinary locomotive reversing gear to effect backward movement; this second engine simply gives motion to the two hind wheels, which by means of ordinary bands and pulleys, and tension pulleys, can be made to act conjointly or independently of the main engine. 2. Instead of placing the engine in the centre, and giving motion to all four of the wheels according to the former invention, the main engine is carried on the fore part of the frame, and actuates the forward wheels only; it has no reversing gear, turns always in the same direction, and ceases to actuate the fore wheels when the driving bands are loosened, which then slip on the pulleys. The steering is performed by operating on the fore wheels; the engine receives its steam direct from the boiler, and when of sufficient tractive power and being of greater speed, the hind part of the arrangements follow without being directly acted upon. Both engines may take their steam from the boiler, or 3, The front or main engines having used the steam, may exhaust into a receiver pro-

vided with two cocks, one to open to the atmosphere, and the other free to communicate with the second engine behind, where the steam may be usefully re-employed; the fore engine will always work first and stop last, and therefore governs the whole arrangement. 4. Relates to the boiler, which is arranged to burn either liquid or solid fuel; when burned together, the inflammable liquid is injected upon the burning fire bed. The major part of the weight of the boiler is brought below the axle, so as to lessen the chances of an upset. 5. Relates to the conductor's seat, which is always turned in the direction of the line of progress. 6. Fitting conical breaks on the axles, so as to act on the pulleys of the hind wheels. 7. Instead of employing straps and pulleys for transmitting the motive power of the engines to the wheels, substituting toothed wheels and pinions. 8. Relates to the adjustment of the tension pulleys, so as to act upon and tighten or loosen the driving bands respectively, when the machine is required to move curvilineally or otherwise out of a direct course. 9. Mounting the wheels on long metal sockets, which carry the driving band pulleys and are acted upon by the breaks, and whereby the wheels are driven irrespective of each other.

[Printed, 10*d*. Drawing.]

A.D. 1864, March 24.—N° 743.

WRIGHT, Robert Holmes.—(*Provisional protection only.*)—This invention relates to marine surface condensers, and "consists "in forming a refrigerator in the bottom of the vessel under the "engine-room floor or any other part of the ship which is made "perfectly water-tight, and forms an inner skin or double bottom "in which space the condensers are fixed, entirely surrounded by "a continuous supply of water taken in at the sides or fore body "of the vessel, and discharged in the run, or most suitable place "after having performed its refrigerating operation; the inlets and "outlets are regulated by valves, which can be shut off when not "required, and the ordinary condenser used by reversing a valve "in the eduction passage for that purpose, the condensers being "continuously surrounded by water, and supplied at the rate of "the vessel's progress through the water, which must always "remain at nearly the same temperature; this object being "obtained without the aid of air or any other pumps must relieve

" the engines of all that power required for working this at present " indispensable adjunct, and effect a great economy in fuel, the " only pumps required in connection with the engines are the " usual feed pumps for supplying the boilers, also a small pipe to " make good any waste of water that may ensue."

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 24.—N° 750.

ROBERTS, William.—(*Provisional protection only.*)—This invention relates to locomotive steam engines, to be used for traction, hauling, and travelling on common roads and other places. Ploughs and tilling implements are hauled, by means of a chain or rope taken upon a winding drum, which is mounted on the vertical axis or pin of the locking motion, underneath the fore wheels. By this arrangement, the engine is made much shorter than (as is usually the case) when the drum is disposed under the boiler, between the fore and hind wheels. The engine framing is supported on two hind driving wheels and two locking wheels in front. A vertical boiler is mounted near the back of the framing, beneath which is the water tank. The cylinders, in inclined positions, are fixed at the fore part of the framing, and work backways on to the crank shaft, which is supported on standards fixed about the mid-length of the carriage; two spur wheels upon the crank shaft are, as occasion requires, set in and out of gear with two wheels on an intermediate shaft, which carries at each end a chain pinion, wherefrom, by means of pitch chains, two chain pulleys, attached respectively to the driving wheels, are set in motion. The intermediate shaft is made in two lengths which abut together in the centre, so that by means of bevelled gearing, the two parts respectively, as may be required, are made to revolve at different speeds. The toothed wheels on the crank shaft can be made to gear with wheels on another intermediate shaft, wherefrom, through a vertical shaft and bevel gearing, motion is given to the drum. Steering is effected by turning the vertical axis by which the fore axle is carried, and which is also rendered capable of adjusting itself to the inequalities of the road. The rope or chain may be led off the drum at any angle. When the engine is used otherwise than for hauling tilling implements, the drum is omitted.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 31.—N° 801. (* *)

BECKTON, JAMES GEORGE.—"Improvements in engines or "machinery for forcing, blowing, or exhausting air and other "gaseous fluids." This is a design for a blast engine, in which the steam and the air cylinders are placed in the same line, the pistons of both being attached to the same rod. To the piston rod of the blowing cylinder is directly coupled a connecting rod which passes through a vibrating gland attached to a slide working in the cylinder cover. This connecting rod drives a crank on the fly-wheel shaft, and its oscillations also move the slide to and fro, so as to open and close the air ports at that end of the cylinder; a similar motion being communicated by means of a rocking lever to a slide for opening and closing the ports at the other end of the air cylinder. The steam cylinder is of the ordinary kind. The whole combination may be set either vertically or horizontally, and be adapted for exhaustion as well as blowing.

[Printed, 1s. 8d. Drawings.]

A.D. 1864, April 1.—N° 812.

PRINCE, ALEXANDER. — (*A communication from John Livingstone Linton.*)—This invention relates, 1st, to the use of ignitable fluids, such as petroleum and other mineral oils and hydrocarbons, as liquid fuel, for the purpose of generating steam in steam boilers, and 2nd, to the apparatus employed, the object being to effect an admixture of atmospheric air with the gaseous vapours evolved from such fluids, by the application of heat. The invention, as shown and described, is adapted to the boiler of a locomotive engine.

The oil or inflammable fluid is contained in a vessel disposed above the level of the boiler, whence a vertical pipe conducts it to an air pipe or funnel, into which it falls in regulated quantity upon a plate, which forms the bottom of a horizontal air passage, and extends into the upper part of the furnace over the centre, where there is a hole through the plate, into which a short down tube is screwed from below. Whilst flowing over the plate, which becomes heated in the furnace, gaseous vapours are evolved, which, commingling with the air current, are carried downwards through a funnel which surrounds the down pipe. The bottom of the furnace is formed with a hollow annular recess, which brings a hollow sided cone in the centre, and in

zones formed round this cone, is a series of annular grooves. The heated fluid falls from the lower end of the down tube upon the apex of the cone, and is partly vaporized by the heat whilst trickling from groove to groove down its sides, flowing thence into the annular recess round the base of the cone at the bottom of the furnace, where it is finally consumed. The flames rising therefrom, after coursing up the sides and under the crown of the furnace, are carried through the heating tubes in the body of the boiler, and thence upwards to the chimney. The air draught which comes down the air admission funnel, is hastened and moistened by a jet of steam.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 2.—N° 828.

PAROD, Ernest Ulysse.—This invention relates to feeding steam generators; it is also applicable to the condensation of steam, and the production of vacuum. It "consists in the "employment of a jet of water under pressure, in such a manner "as to induce along with the jet a current of gas or steam, "thereby effecting the condensation of the escape steam of steam "engines, and the production of a vacuum, whilst at the same "time as the jet of water which serves to induce the current of "gas or steam possesses a high velocity and considerable mo-"mentum, it is proposed to utilise its momentum by causing it "in company with the condensed steam to penetrate into the "steam generator, thus producing a novel system of feeding "steam generators. The pressure or force of the jet should be "such that its momentum will be greater than that of an equal "sized jet issuing from the boiler under the steam pressure "therein." In its practical application, it is proposed to force water into a strong closed vessel, provided with a manometer to show the pressure, and a water gauge. The lower part of the vessel is constantly supplied with water, forced into it at the rate of its exit through the jet pipe. The upper part of the vessel contains highly compressed air, which is maintained by keeping the water at a uniform level; discharge cocks, for use in regulating when required, are provided. A passage pipe, attached to the lower part of the vessel, terminates in a jet nozzle, the open end of which is capable of being increased or diminished; a stop cock or valve is interposed in the passage pipe between its two extremities. The water issues from the nozzle in a powerful jet

with considerable velocity into a closed funnel-shaped chamber attached to the end of the eduction pipe, which receives the exhaust steam from the engine. The jet of water with all its force, enters the narrow neck of the funnel and induces or draws the steam with it, which is thereby condensed, the force of the jet being sufficient to impel the current on through the feed pipe into the boiler, or elsewhere if required. Suitable cocks and valves are provided. A suction and force pump may if necessary be employed to assist in forcing the water onward to the boiler.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 6.—N° 862.

SMITH, George, the younger. — This "invention relates to a "peculiar construction and arrangement of rotatory engines to "be worked by steam, air, gas, or water, and consists, according "to one modification, in the employment of a hollow driving "drum provided with end covers or disc plates, which are fitted "upon a driving shaft in such a manner as to allow the drum "and disc plates to have free longitudinal play thereon, whilst "the shaft is carried round therewith. This drum and shaft are "placed eccentrically inside the main working cylinder of the "engine, and a number of slots or openings are made equi-"distant in the surface of the drum, in each of which is placed a "roller, which serves as a rolling and revolving piston. These "rolling pistons are interposed between the internal surface of "the main working cylinder and the periphery of a smaller "drum situate inside the main driving drum, but placed "concentric with the working cylinder, the rolling pistons thus "rolling and revolving between the two surfaces of the working "cylinder and the small internal drum. The steam or other "medium employed in working the engine is introduced and "allowed to escape by two sets of separate and independent "ports or passages, or, if desired, the ordinary arrangement of "ports or passages may be used." According to a second modification, the main driving drum is dispensed with, and cross grooves or channels are made in the disc plates, for the purpose of guiding the pistons, as they roll between the surface of the smaller drum, and the internal surface of the main working cylinder.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 7.—N° 872.

BONNEVILLE, Henri Adrien. — (*A communication from Eugène Petry Chaudoir.*) — (*Provisional protection only.*) — This invention relates to apparatus for cleaning the external surface of the tubes of steam boilers, which consists of a sheet iron plate, perforated to correspond with the holes in the boiler tube plates, so that the plate may be made to slide from end to end of the tubes, and scrape off all matter incrusted or adhering thereto; the holes in the perforated plate correspond exactly with the number and position of the tubes, and are of sufficient size, when the plate is drawn from end to end of the tubes by means of handle rods, which pass through stuffing boxes from the outside, to allow it to slide easily along.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 11.—N° 902.

BECKS, Arthur Thomas. — (*Provisional protection only.*) — This invention relates to the construction of steam boiler furnaces adapted to the combustion of gas, which is produced in an apparatus or gas producer contiguous to the boiler. A horizontal sheet or blast of air is introduced immediately over the upper ends of the inclined fire-bars of the gas producer, when the ash-pit is closed. "The gas produced by the partial combustion of "the coal in the gas producer passes by a helical channel from "the bottom to the top of the gas producer, and so far warms "the fuel in the upper part, that when the coal descends to the "bars it contains little or no water, and readily enters into com-"bustion. The gas after leaving the producer passes through a "series of condensing pipes, the lower bends of which open into "water. Any condensable matter in the gas is condensed in "passing through the said pipes and runs into the water. The "condenser pipes are connected with one or more flues passing "horizontally through the whole length of the boiler. At the "end of the boiler opposite that at which the condenser pipes "enter the said flue or flues a pipe or pipes are fixed opening "into the said flue or flues, and descending to the channel under "the boiler, where they deliver the gas for burning. Besides the "flue or flues described a similar flue or flues pass through the "boiler for conveying atmospheric air, which is delivered under-

"neath the boiler by a pipe or pipes similar to those which "deliver the gas. The mixture of gas and air is ignited under "the boiler, and the products of combustion pass to the chimney; "the said products of combustion pass on their way to the "chimney through a chamber at that end of the boiler at which "the gas and air enter the flues in the boiler; the pipes by "which the gas and air are delivered to the flues are thereby "heated."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 11.—Nº 904.

GEDGE, William Edward. — (*A communication from Jean François Maumenée.*)—This invention, relating to apparatus for condensing steam, consists of a channel dug in the earth, wherein there is a running stream. A pipe in connection with the exhaust pipe of the engine, is longitudinally submerged in the running water, the speed of which should be about 20 inches per second; the channel ends against, and communicates with a tank of wood or iron through an opening in the side. An elbow pipe, leading from the cold water pump, delivers the water into the tank, and thus feeds the condensing channel, through which it runs off. The extremity of the condensing tube, after passing through the tank, terminates outside in a bent pipe, from which two branches communicate with a small pump, which throws into a reservoir placed beside it, the steam, air, and water drawn from the condensing tube: the feed pump takes water from the reservoir. Another apparatus is described, composed of a cast-iron bell-formed receiver, surmounted by a cylinder closed above and furnished with a cock on one side, and a water level on the other. Two pipes enter at bottom, one from the feed pump, and the other, provided with a retaining valve, leading thence to the generator. Another of the apparatuses described, consists of a compound pump, which combines the functions of the cold water pump, and the air and feed pumps. The piston consists of a hollow cylinder closed at its extremities by the flanges of two small tubular rods, fixed in a line with the axis of the cylinder; the lower tubular rod acts as a piston to the feed pump; the upper rod acts as the piston rod; it is united to the connecting rod by a cross head and has an escape valve at the top. The three packings are of the nature of stuffing boxes, which may be tightened up during the working

of the pump. Two pipes are fitted to the lower part of the pump cylinder on opposite sides, one communicating with the wells, fitted with a suction valve, and the other, which leads to the cold water tank, with a delivery valve; these are operated by the bottom of the piston. The space above the piston is, by means of a pipe, put into communication with the condenser and constitutes the air-pump. A modification of this pump is described, and also a second condensing apparatus, in which cold air currents are obtained by a powerful fan.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1864, April 13.—N° 932.

MILLER, Thomas William.—This invention relates to motive-power engines actuated by steam and air combined. Instead of the usual form of cylinder, these engines are constructed with a four sided chamber wherein the steam and air act upon a piston plate, which in consequence of the peculiar form of the chamber and the manner in which the steam and air operate, has a lateral action combined with its ordinary motion. The four sides of the chamber are disposed at right angles with each other, but only two are rectangular with the top and bottom, the other two sides are placed at an angle, so that if the chamber were stood on its end it would incline to one side. It is longitudinally divided by a division plate. The edges of the four sided piston plate fit the four sided chamber with its packings, and "works from end to " end, and traverses at the same time laterally through the " division plate, so that it produces on one side of the division " plate a gradually increasing surface, and on the other side of it " a gradually decreasing surface by its passage during one stroke, " and vice versa, by its passage during the reverse stroke. This " chamber, in addition to its being divided by the division plate, " is also again divided by the piston, so that it has four com- " partments or chambers of alternately increasing or diminishing " capacities, which may be distinguished as, first, the right steam " chamber; second, the right atmospheric chamber; third, the " left steam chamber; and fourth, the left atmospheric chamber. " Both the steam chambers become alternately vacuum chambers " by the action of the condenser, whilst the two atmospheric " chambers are left constantly open to atmospheric pressure. " The main chamber thus subdivided is provided with the

"necessary slide or other valves for the admission of steam from "the boiler, and for the eduction of steam from the chamber into "the condenser." It is intended that an engine so constructed shall be combined with a condenser, hot well, air and feed pumps, and the usual appliances of an ordinary steam engine.

[Printed, 1s. 6d. Drawings.]

A.D. 1864, April 13.—N° 934.

COPE, James.—This invention relates to apparatus employed in connection with steam ploughing and is otherwise applicable to traction and portable steam engines. It consists (amongst other things) in securing the anchor or holding apparatus to the engine and making it in the form of a thin disc, which may be made to rotate on an eccentric centre and enter the ground when the longest radius is brought under the centre. It may be eccentrically mounted on one of the axles of the running wheels, and when required, by turning it half a revolution so as to bring its major radius under the axle, it will cut its way into the ground, and in that position will offer considerable resistance to lateral pressure; instead of being on the axis it may be mounted on a rocking frame. The invention also consists in mounting the winding drum horizontally under the lower part of the boiler, about on a level with the fire-bars, and supporting it by means of friction wheels or rollers; in this low position resistance can be more favourably offered to the pull of the rope. By means of a supporting screw, the boiler is maintained in a horizontal position when descending or ascending inclines; this apparatus, which by means of suitable connections is operated by the attendant, is applied at one end of the boiler. Instead of by the screw, the end of the boiler may be raised or lowered by an hydraulic pump, upon the plunger of which it is disposed; other means for raising the end of the boiler are suggested. The last part consists in giving the axles of the running wheels liberty to rock on a centre, so that the wheels, however unlevel or uneven the surface of the ground may be, will always be in contact therewith, whilst the body of the engine maintains its normal position.

[Printed, 1s. 10d. Drawings.]

A.D. 1864, April 14.—N° 942.

MOORE, Sampson.—This invention relates to steam cranes of various kinds, and to similar gear used for lifting and removing

heavy weights, such cranes and apparatus being also furnished with hand gear. It consists in the arrangements for applying the motive power, whereby the chain barrel or barrels are actuated by means of a peculiar combination of friction driving wheels, and in the use of two or any greater number of barrels for winding on the chain or rope, in order that a longer length of chain may be employed.

As applied to any ordinary stationary jib crane, the central revolving pillar of which is stepped low down beneath the surface in an appropriate bearing, and carries above the surface level the platform whereon, mounted on one side of the vertical axis or pillar so as to counterbalance the weight of the jib, is a vertical boiler disposed between a pair of engine cylinders, which are fixed at a suitable angle for giving motion to a crank shaft which carries the first friction pulley, whence the power is transmitted through other shafts and pulleys to one or more winding barrels, and to the swivelling gear. The engine is fitted with reversing gear, the distinct powers of the crane being brought severally or otherwise into activity by means of a hand-lever and other suitable appliances. Handles are provided for the purpose when required to work the crane by hand. A modification, exhibiting the arrangements for working the chain in connection with two barrels, is described.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, April 15.—N° 951.

ROWING, Esau.—(*Provisional protection only.*)—This invention relates to steam engines and boilers. In respect to engines, a double piston valve, comprising two pistons on one valve rod, is employed; the steam being admitted between the pistons, presses equably on both. A recess opposite each port is formed in the cylindrical valve casing, so that by only a slight movement of the valve, a sufficient quantity of steam is admitted to the cylinder. The motion is obtained from an excentric. The engine governor is placed over the excentric rod, which is connected to and so acted upon by the movements of the sliding sleeve on the governor spindle, as to increase and diminish the traverse of the valve, and thereby produce variable expansion. The main piston, made hollow and nearly half the length of the cylinder, acts as the exhaust valve, the exhaust port being placed about the midlength of the cylinder.

The boiler or generator comprises three longitudinal tubes disposed horizontally side by side a convenient distance apart. These main tubes are connected by short tubes, and two superheating tubes are disposed above, into which the steam generated in the main tubes, passes before it is used in the engine cylinders. Along the whole length of the main tubes, numerous small tubes depend from their under sides. These small tubes contain inner tubes, which are for the purpose of separating the upward and downward currents of water, caused to take place in the tubes from the effect of external heat. The generator is inclosed within fire-brick furnace walls, wherein an air passage is formed in communication with the closed ash-pit, so that the air which supports combustion may be admitted to the furnace in a heated state. The feed water is heated by the exhaust steam, which is discharged within a water tank disposed under the boiler. The working parts of the engine are fixed on the plate which supports the main longitudinal tubes.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 16.—N° 956.

BARLOW, HENRY BERNOULLI.—(*A communication from Jacob Salter.*)—This invention relates to the slide valves of steam engines, which valves are so constructed, that with a single eccentric or tappet and one valve spindle, the steam (without interfering with the exhaust passages) may be cut off at various parts of the stroke. It consists in applying a movable plate "to "the slide valve; this plate is provided with passages for the "admission of the steam from the valve box to the slide valve, and "thence to the cylinder; the valve rod is attached to this moveable "plate, and the throw of the excentric or tappet by which the "valve is worked must be equal to the traverse of the valve, and "the traverse of the moveable plate on the valve. When the "engine is at work and the piston has arrived at or near the end "of the cylinder, the exhaust ports are open and remain open for "the escape of the exhaust steam, until the position of the moveable "plate has been changed to shut off the steam. By varying "the size of the passages in the moveable plate, and the relative "proportion between the traverse of the valve and the traverse of "the moveable plate, the steam can be cut off at any desired "portion of the stroke." Other arrangements and modifications are shown and described.

[*Printed*, 10*d*. Drawing.]

A.D. 1864, April 16.—N° 963.

COOPER, Meshach Brittan.—This invention, relating to rotary engines, is supplementary to two former Letters Patent dated respectively June 2, 1855, No. 1259, and January 2, 1861, No. 10; the former was granted to John Lane and John Taylor, and the latter to John Taylor and the present inventor. Instead of making both the cylinder and the piston rotate (in accordance with the inventions referred to) the several parts are now so arranged and fitted, that the cylinder remains stationary, while the piston moves on its axis and gives off motion, or it may be that the piston is stationary whilst the cylinder moves. In the modification preferred, the piston moves round the axis of the cylinder, which remains stationary. The cylinder is short in proportion to its diameter; a sole plate is cast to it, which is bolted down upon the foundation; one end of the cylinder is closed by a plain plate, and the opposite end by a plate which concentrically carries a stuffing box. The piston is in the form of a drum pulley, but much less in diameter than the cylinder, wherein it fits lengthwise between the ends, and by means of a crank is made partly to roll and partly to slide with its periphery always against the internal surface of the cylinder. The shaft enters the cylinder through the stuffing box; the end inside the cylinder is cranked and radially slotted; at the bottom end of this slot there is a spring which acts divergently against a sliding bearing in the slot. The central boss of the piston carries a fixed pin, which works in the sliding bearing in the slot of the crank, the periphery of the piston being in contact internally with the cylinder surface and constantly pressed against it by the divergent action of the spring. A fixed tongue piece or resistance plate is radially attached to the periphery of the piston which, as the latter forces the crank round, works edgewise to and forth through a longitudinal opening in the cylinder side, and so forms a constant resistance to the steam. On each side of this opening the induction and exhaust ports are respectively situated. Suitable packings are provided. A short distance from the stuffing box, the shaft is supported by a bracket bearing, beyond which it carries a strap pulley, wherefrom the power is given off.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 20.—N° 983.

BRIÈRE, Julian.—(*Provisional protection only.*)—This invention is styled "the continuous self-acting condenser, being a new

" boiler feeding apparatus," it is supplementary to a previous invention for which Letters Patent bearing date August 18, 1862, No. 2317, were granted to this inventor. The novelty of the self-acting feeder consists in the employment of a rocking frame and shaft, which are caused to tilt in one direction by the weight of water introduced into a reservoir fixe d upon the frame and to tilt in the contrary direction by means of a weight. The two round valves or cocks, mentioned in the former Specification as being put in action by the vibratory movements of the frame are dispensed with and the apparatus is now put into communication respectively with the boiler and with the water supply by flat slides, which follow up and adjust themselves as they wear, and so constantly maintain themselves true and tight, while worked to and fro by means of rods and levers connected to the rocking frame, whereby they are actuated. When a large quantity of water has to be supplied, the pressure on the slides is obviated "by causing the " rocking frame to give motion to a small slide which admits " steam to a piston for giving motion to other slides which open " and shut the communication between the boiler and supply " water according to the level of the water in the boiler."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 20.—N° 991.

NEWTON, WILLIAM EDWARD.—(*A communication from Frederic Ernest Perret.*)—This invention relates to the construction of equilibrium slide valves, applicable to steam, gas, air, or water engines. The piston, instead of working in contact with the main cylinder, is placed and works inside a second cylinder, which is longitudinally movable within the main cylinder, the diameter of which is contracted at each end, where only the surface of the two cylinders come in contact. The inner cylinder has only a limited action imparted to it by an eccentric on the main shaft, and it is this inner cylinder which performs the functions of a slide valve, making, every stroke of the piston, a short stroke, sufficient alternately to uncover and close the inlet and exhaust ports, which are thus brought at the proper time coincident with the supply and delivery passages. The steam surrounds the inner cylinder in the annular space formed between it and the main cylinder, so that the pressure at each lateral point is equalized. The piston operates in the ordinary way in the inner cylinder, and the piston rod works through a stuffing box at the end; the

ends of the inner cylinder also work through annular boxes suitably packed.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 21.—N° 995.

ARMSTRONG, JONATHAN.—(*Provisional protection only.*)—This is an invention relating to steam hammers.

1st. After the heated metallic mass has been placed on the anvil and operated upon by the vertical stroke of the top hammer, it is acted upon laterally by two side hammers, which render the turning of the heated mass upon its side unnecessary, the two side hammers and the top hammer acting thereon in succession until the mass is reduced and shaped to the required form.

2nd. Relates to regulating the force of the blows. "The " hammer, as in ordinary cases, consists of a cylinder with tool " attached to it, the cylinder or hammer having two hollow " piston rods or stalks, one of which acts on the bottom of the " cylinder, the other lifting it; thus, if a light blow is to be " struck only, a little steam is admitted into the top of the " cylinder, retaining it by means of a second rod in communica- " tion with the exhaust valve, and letting it out according to the " force of the blow I wish to strike; if a heavy blow is to be " struck, a sufficient quantity of steam must be let into the " bottom of the cylinder to force it against the metal on the anvil. " The above described improvements are applicable to hammers " employed in chainmaking, and also to compressed air hammers."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 22.—N° 1014.

RIVETT, JOSEPH CEDRIC.—This invention relates to apparatus for lubricating the cylinders of steam engines and other parts of machinery. It consists of a cylinder which may be open at one end and closed at the other, excepting a small opening in the centre which is fitted with a valve pressed against its seat by a spring. In order to fill the cylinder with the lubricant, the piston which it contains is raised by means of a hand wheel on the top of the piston rod, and when filled the piston is lowered upon the lubricant, which, by means of suitable mechanism, is forced at a regulated speed through the valve at the bottom of the cylinder, and distributed, by means of tubes, in the directions required.

The piston rod is screw-threaded, and works through the boss of a worm wheel, which is internally screwed to receive it. This wheel is actuated by a worm, set in motion by a pawl lever by means of a ratchet wheel. The lever obtains regulated vibratory movement from the machinery. The piston consists of two disc plates with hempen or other suitable packing interposed, which, when the plates are pressed together by means of a nut upon the end of the piston rod, causes the piston to fit sufficiently tight to prevent its being revolved within the cylinder by the intermittent movements of the worm wheel.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 22.—N° 1022.

NEWTON, ALFRED VINCENT.—(*A communication from Addison Smith.*)—This invention relates to a rotary engine, adapted for forcing air or water, or applying motive power. It is described as follows :—"Within a fixed cylindrical case fitted with heads which " are severally provided with a hollow projecting excentric hub, is " placed a smaller hollow cylinder. This inner cylinder is pro- " vided at its ends with hollow journals which are concentric and " slightly conical. These journals have their bearings in conical " thimbles affixed to but adjustable endwise in the hollow hubs " of the outer cylinder. Through the inner or excentric cylinder " passes a shaft which is concentric with the outer cylinder. This " shaft is coned at its ends and fitted to conical thimbles carried " by fixed external bracket bearings, and adjustable endwise " therein. The periphery of the inner or excentric cylinder is " fitted longitudinally with rollers which are slotted and form " rocking guides for sliding plates, which plates constitute the " pistons or vanes of the engine, and of which there may be " three or more. Supposing three of these plates to be used . . . " they are set radially round the before-mentioned shaft that " passes through the excentric cylinder, and are of such length as " to extend to and touch the inner periphery of the fixed cylin- " der. One plate or vane is bolted to collars keyed to the shaft, " and the others to collars loose on the shaft, the loose collars " being fitted with an oil box to ensure freedom of motion. " Inserted in the fixed cylinder is an adjustable packing strip " placed longitudinally of the cylinder, and against this the " excentric cylinder is caused to bear. On the outer edge of each

" plate or vane is arranged a packing strip or shoe, which is free " to work out radially as the shoe wears away. In the periphery " of the outer cylinder or case induction and eduction openings " are made for the passage of the air, water, or steam, and the " projection of the radial plates or vanes from and their with- " drawal within the inner excentric cylinder is effected by the " rotation of that cylinder, which rotation is produced in the case " of a motive-power engine by the pressure of the impelling fluid " on the plates, but when the engine is used as a blower, by the " application of power through a pulley keyed on the hollow " journal of the excentric cylinder. The guide rollers turn freely " in their socket bearings, and are fitted with spring packing to " press against the sliding plates. The adjustable conical " thimbles allow of endway adjustment of the vanes or plates, " and also of the excentric cylinder, so as to keep them from " grinding against the heads of the outer cylinder."

[Printed, 10*d*. Drawing.]

A.D. 1864, April 23.—N° 1034.

NORTH, Richard.—(*Provisional protection only*.)—The object of this invention is to effect the more perfect combustion of fuel in furnaces of steam and other boilers, and also the consumption of smoke. The inventor employs a perforated square tube, curved or bent in conformity with the transverse internal form of the front of the furnace. The open ends of this tube are fixed respectively at each side of the mouth of the furnace, into the dead plate, and may be made to constitute the furnace door frame; the ends opening through the dead plate admit the atmosphere in quantity regulated by suitable valves, operated by the attendant. The air, issuing in jets through the perforations of the tube into the front part of the furnace, is distributed equally all round and over the fire, whereby the combustion of the fuel is rendered more complete.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 26.—N° 1051.

THOROLD, William.—This invention relates to condensing the waste steam from steam engines by bringing it in an attenuated state into contact with currents of air within a closed vessel. After the steam leaves the engine cylinder, it is conducted either

into such a rotary engine as "Avery's," or into a turbine, where, having operated by reaction, it escapes from the periphery into a surrounding casing, where it is brought into contact with cold atmospheric currents, forced in by fans or pumps, worked by the rotary engine or the turbine, or by the main engine. The superfluous air or gas escapes to the chimney through orifices in the casing, and may be conducted through pipes to the boiler furnace. The water of condensation is collected in the lower part of the casing, and thence pumped or injected into the boiler. In some cases water in fine spray is thrown by suitable arrangements from off the periphery of the rotary engine or the turbine, which greatly assists the process of condensation. Other arrangements are made for condensing exhaust steam by causing it to issue from fixed jets, and come into contact with jet currents of cold atmospheric air contiguously arranged. The specification and drawings exhibit and describe various plans for carrying the invention into practice as applied to stationary, locomotive, marine, and other engines.

[Printed, 1*s.* 6*d*. Drawings.]

A.D. 1864, April 28.—N° 1063.

MARTIN, LOUIS EMILE CONSTANT.—This invention of "improvements in boilers and apparatus for generating steam," consists in constructing boilers with two or more fire-places or furnaces. The form or construction of such a boiler may be varied according to its intended use. The furnaces are, by preference, constructed within the boiler, but if desired may be placed underneath. From the upper part of each furnace, vertical tubular flues conduct the flaming products of combustion into an upper chamber, contained within the boiler below the water level. If desired, arrangements may be made to superheat the steam by the introduction of flue tubes leading from the chamber into the steam space. In some cases steam is introduced into the chamber to mingle with the burning gases, the products of which pass from the chamber by means of a descending flue or flues into a furnace, upon the grating of which coke or other suitable fuel is burning; a fan is used to draw the hot draughts downwards through the coke fire into the boiler flues, and thence to the chimney. The construction of the furnaces and internal arrangements may be varied and modified.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 28.—N° 1065.

PARKER, James.—(*Provisional protection only.*)—This invention relating to the application of steam combined with air as a motive power, and for other purposes, is supplementary to Letters Patent bearing date October 23, 1863, No. 2620, which were granted to this inventor. The present invention consists,—

1st. In heating the receiver or engine cylinder into which the combined fluid vapour is admitted, otherwise than by the heat of such fluid vapour, so that, by superheating or surcharging the combined vapour with heat, further expansion thereof may be obtained.

2nd. Obtaining "a further increase of motive power by using "the steam and air after it has been once used in a cylinder at "rather high pressure by again combining or mixing the dis-"charged steam and air with other atmospheric air by passing "the steam and air on its discharge from the first cylinder into a "receiver, and from thence through other jets or apertures into "other open air nozzles or pipes communicating with a second "cylinder or receiver in connection therewith, and after it has "been thus used as or to obtain motive power, it is conducted "directly to the furnace or to a receiver or pipes, or channels "leading thereto."

3rd. Obtaining a fresh supply of aerated water, by condensing the combined fluid vapour after it has been used as a motive power in an engine.

4th. Proposes "to use the cooled or partially condensed steam "and air, as motive power in engines with cylinders having "flexible sides."

The invention further relates to the employment of the combined fluid vapour, after it has been exhausted from an engine cylinder, to act as a humid hot blast upon the fuel in the furnace, instead of allowing it to blow off up the chimney, and thereby in the usual way induce a draught of cold atmospheric air through the furnace bars.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 30.—N° 1099.

BOULTON, Matthew Piers Watt.—(*Provisional protection only.*)—The object of this invention, in connection with the mode of working steam and caloric engines, is to employ that portion

of the heat which is generated by the combustion of the fuel, and which is ordinarily wasted and carried off through the flues to the chimney. The following method is employed. A force pump is worked by the engine which forces the air into the furnace or combustion chamber, and thence "onwards into the "water contained in the boiler. The heated gases after issuing "into the water are made to pass through a number of small "orifices, and so to rise in numerous currents through the water, "communicating heat to it in their passage as the bubbles of "steam do in rising through the water in an ordinary boiler. As "the air is forced through the force pump at the ordinary tempe-"rature of the atmosphere, while when it acts on the piston its "temperature is much higher, there is gain of power in this "part of the process. In fact the engine is a combination of the "steam engine and the caloric engine." Any description of solid, liquid, or gaseous fuel may be used, and particular arrangements provided for their combustion.

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 3.—Nº 1112.

BOULTON, Matthew Piers Watt.—(*Provisional protection only*.)—This invention relates to a mode of obtaining motive power by the combustion of fuel, and consists in utilising the expanded gases generated during its combustion. For this purpose, the air and gases, which pass through the chamber wherein combustion takes place, are first made to actuate an engine, whence they issue into a flue, and communicate heat to the water in the boiler of a steam engine. The heated gases may be employed to work the piston of a caloric engine, or to actuate mechanism on the principle of the turbine, to effect which, air may be forced into a chamber where ordinary fuel is burnt, or aeriform matters in inflammable proportions, such as a mixture of air or oxygen with hydrogen, carburetted hydrogen, carbonic oxide, vapour of petroleum, vapour of naphtha, or with vapour of oils generated either by heat, electricity or chemical action; and inflammable gas may be employed to operate engines, contrived for the purpose of being worked by the explosion of gas mixed with atmospheric air, the heated products being afterwards employed to impart their heat to water in the boiler of a steam engine.

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 3.—N° 1113.

WARD, PETER.—This invention relates to lubricating compounds, the preparation of which (for such use as a lubricant in steam engine cylinders) consists in dissolving an earthy soap in petroleum oil, to be used with or without the addition afterwards of tallow, or fat, or lubricating oils. The following is the process employed; an iron vessel capable of holding 1,500 gallons is provided, in which is 500 gallons of water and 4½ cwt. of hard white soap made from tallow; when heated and the soap dissolved, 12 cwt. of the heavy petroleum oil is added, and as much of a solution of sulphate of alumina (at about 30° Twaddle) as will decompose the soap, which effect is asertained by the usual indications. The water is then run off and fresh water added and again run off, until all traces of the aluminous salt, that may have adhered to the earthy soap, have been washed out; 1,600 cwt. of refined tallow free from acid is then added, and the heat is increased until the composition becomes uniformly mixed and smooth in appearance; it is then allowed to stand six hours to allow the water to separate and be drawn off. The compound is then run into casks, and when cool is fit for use. It is stated, that being free from acid, no injury results to the cylinders, and 40 per cent. more work is obtained from the compound, than from the same weight of either oil or tallow. Other lubricants are prepared in the same way, in which the ingredients and proportions are modified.

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 4.—N° 1123.

McVITIE, WILLIAM.—(*Provisional protection only.*)—This is an invention which relates to arrangements for inducing the circulation of a liquid for condensing or refrigerating, and is designed to dispense with the motive power usually employed; it is applicable to surface condensers, especially in connection with marine steam engines. The "usual pump is dispensed with, "and the passages by which the cold liquid, such as sea water, "is admitted into and discharged from the condenser, and the "spaces in the condenser itself are arranged as herein-after in- "dicated in such a way that the liquid in those passages or spaces, "and which becomes warmed in the process of condensation, and "is thereby rendered specifically lighter, forms a column opposed

"to the external colder and heavier column. The result is that "the internal column as it becomes warmed and lightened is "continually displaced by the cold liquid from the outside, a "continuous current being thus produced. The minor details of "the arrangements may be very much varied to suit different "designs of engines, and different circumstances and conditions, "but the discharge outlet is placed as high as possible above the "virtual inlet into the condenser, and the spaces within the con-"denser are arranged so that the liquid may pass through it in a "generally upward direction. The discharge must however be "below the external water level. The arrangements for refri-"gerating or cooling liquids will be similar, the refrigerating or "cooling liquid being taken from and discharged into the same "reservoir, or into different reservoirs of the same or nearly the "same level."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 4.—N° 1131. (* *)

RICHARDSON, Charles James.—"Improvements in arrang-"ing steam boiler and other furnaces, in order to render them "more suitable for burning petroleum and like oils." The lower part of a furnace is formed with several chambers for the oil, communicating with a cistern from which the oil is admitted. These "chambers are packed tightly with porous material," up which the oil ascends and burns at the surface. Communicating with and at a higher level than the oil chamber is a "vapour "chamber," from which the vapour of the oil is conveyed to a perforated tube beneath the boiler, and allowed to escape. It takes fire, and its combustion is aided by a supply of air from pipes. "To prevent the grate getting too hot" and to save fuel, the water from the boiler circulates through the grate and returns; and the air and vapour tubes are prevented from getting too hot by a shielding plate.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 5.—N° 1138.

NEWTON, Alfred Vincent.—(*A communication from Albert Borsig, Edward Freudenthal, and Alexander Daelen.*)—"This "invention relates to a novel mode of constructing steam boiler "and other furnaces, and of supplying air thereto to support

"combustion. The fuel is fed to the fire-place from a closed "hopper, and the ash-pit is also closed. Compressed air either "heated or otherwise, is supplied by a suitable arrangement of "pipes both above and below the fuel. These currents of air, "the one descending through the fuel, and the other passing "between the grate bars and ascending through the fuel, meet "and effect a vivid and very perfect combustion of the fuel."

According to one modification, "the coal as it descends from "the hopper will fall on to a ledge of fire-brick, below which a "current of compressed air enters the furnace, while a separate "current descends with the fuel. The fuel thus arrested by the "ledge of fire-brick will become heated and attain incandescence "before reaching the fire-bars. The fuel is discharged from the "ledge by means of a piston operated by a crank lever."

According to another modification "the gases of combustion "collect in an annular flue surrounding the fire-place, and are "led off through radial passages, and are thence led off to be "applied as may be desired. The streams of air for supporting "combustion will in all cases be separately regulated by suitable "valves. The action of a current of compressed air passing up "to the fuel between the fire-bars will be to mingle with the "descending current, and thus produce a heat sufficiently intense "for smelting and other metallurgic operations." As further modified, an adaptation of the invention to reverberatory furnaces is shown and described.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 5.—N° 1139.

HASELTINE, George.—(*A communication from James Atkins Woodbury.*)—This invention, relating to slide and cut-off valves for steam engines, consists, 1, in so constructing and arranging the slide valve, that the pressure of steam is nearly equally balanced on the opposite sides or faces. 2, Relates to a variable apparatus for operating the cut-off valve, whereby the flow of steam is so regulated, as to equalize the speed of the engine, however much the power required, within its capacity, may be varied. The back of the slide valve is flat, but the face is chambered out; the sides incline for the purpose of allowing the valve to settle as the surfaces wear. The valve seat is provided with steam and exhaust ports, and has upon its surface a sunken

space in communication with the boiler, always filled with steam at the full pressure, whereby the valve is lifted against the back pressure, thereby producing a balance. The cut-off valve to which the variable apparatus is applied, is formed of two cylinders placed within the valve case; the outer one stationary within a steam chamber. The inner cylinder fits loosely within the other, and turns with a shaft to which it is attached. Both cylinders are provided with steam admission ports, so relatively arranged, that they pass and repass each other every direct and reverse stroke whatever the length may be. The regulation of the flow of steam is effected by the speed of the stroke, whereby the ports are a greater or lesser time in passing each other. The apparatus is attached to the shaft with which the inner cylinder revolves, and which passes through both ends of the valve case; on the end of the shaft there is a crank arm, which receives motion from the eccentric by the connection of a rod and a rocking lever, the fulcrum of which slides in a slot and is adjustable; it is operated by the governor by means of a sliding block and connecting rod. As the governor balls rise or fall, the shifting of the fulcrum increases and diminishes the action of the inner cylinder by means of the mechanism interposed, consequently, the longer the action, so in proportion is the time shortened that the steam ports in the cylinders are coincident, and when the action is short, the time occupied by the ports passing each other is proportionately lengthened and the steam cut off accordingly.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 5.—N° 1142. (* *)

MILLER, JAMES JOHN, junior.—"Improvements in steam "engines and pumps."

The piston and cylinder are constructed in such a manner that by the rotation of one of them, and by having passages in the piston, the induction and eduction ways are opened and closed. It is preferred to form the piston of a length corresponding with that of the stroke of the engine, and to make the cylinder proportionably longer. About the middle of the cylinder are, one induction and two eduction passages. In each end of the piston is a passage through which steam or fluid may pass into and from the cylinder. Each of these passages communicates with a groove or recess, formed longitudinally on the outer surface of the piston.

Just before the piston completes its stroke, the piston in the cylinder is caused to make a partial rotation, so as to change the relative positions of the way in the cylinder, and the grooves or recesses in the piston. When worked as a pump the piston rod is connected with a crank, driven by manual or other power, and the induction and eduction pipes are made the suction and supply pipes.

[Printed, 8*d*. Drawing.]

A.D. 1864, May 6.—N° 1151.

BARCLAY, Andrew.— This invention relates to apparatus employed for injecting and ejecting fluids by means of constant jets or streams of other fluids under pressure moving at high velocities, and mainly consists "in extending the annular nozzle, " used in instruments for injecting liquids, through which the " liquid passes to a much greater length than has hitherto been " accomplished, also in forming an annular passage beyond the " first-mentioned nozzle for the purpose of obtaining an annular " sheet of steam or water after the stream has passed through " this nozzle; by this arrangement a far superior force both for " raising and also for forcing fluids generally is obtained.

Forms "a tapered or conical condenser, into which steam or " other condensable vapour is admitted in such quantity as may " be required for the purpose of injecting or ejecting fluids. In " this arrangement the fluids either injected or ejected have imparted to them the momentum of the fluid, moving with the " velocity of the vapour used rushing into a vacuum. In this " apparatus the condensation may be effected in any of the modes " generally used for condensing steam or other vapours."

"The apparatus consists essentially of a hollow truncated cone " terminating in a nozzle placed inside a hollow cylindrical vessel " in which vessel the condensing fluid is admitted, so that it " condenses the injecting or ejecting fluid or vapour, thereby " producing a partial vacuum in the conical chamber, the fluid to " be injected or ejected is admitted through a suitable pipe or " duct connected to and passing through the side of the outer " vessel into the conical one, whence it is injected or ejected " through the nozzle at its extremity, passing thence to any place " where it may be required."

[Printed, 1*s*. Drawing.]

A.D. 1864, May 6.—N° 1153.

TOMLINSON, John.—(*Provisional protection only.*)—This invention relates to the application of motive power to omnibuses and vehicles on common roads, also to ploughing and tilling implements. The carriage or vehicle is formed with single or double side plates, between which on each side, a steam engine cylinder is placed; the central space is occupied by a locomotive formed boiler; a receptacle for fuel is made between the fire-box and body of the vehicle, and extends partly under the foot plate. The hollow bottom and space under the seats, are formed into water tanks, and the fore part of the body is arranged as a receptacle for parcels and goods. Seats are to be arranged on the roof for four rows of passengers; the body is borne on springs upon the axle, loose upon which revolve two driving wheels; to these wheels are attached drum pulleys, which obtain motion by means of straps from two smaller pulleys respectively fixed on the ends of the crank shaft, which is transversely disposed between the end of the boiler and the fore carriage, at right angles with the engine cylinders, in a position to be actuated by the pistons and connecting rods. The small drum pulleys are capable of being thrown out of gear when not required. An arrangement, consisting of a steam cylinder and piston for regulating and maintaining the body of the vehicle in a level position, is disposed underneath. A steam gauge is placed in a conspicuous position, and also " levels, by which the driver can main-" tain the horizontality of the whole apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 7.—N° 1160.

HANDCOCK, Elias Robison.—(*Provisional protection only.*) —This invention relates to rotary engines to be worked by steam or other motive power. The outer rim of the engine cylinder " is " of a hollow annular form, into which steam is admitted from " the boiler through a steam stop, which also serves as a fulcrum " for the steam to abut against. In this hollow annular cylinder " pistons are inserted, against which the steam acts, and as this " annular cylinder is attached to the shaft or axle much in the " same manner as an ordinary fly wheel, a rotary motion is " imparted to the machinery."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 9.—N° 1178.

NEWTON, ALFRED VINCENT.—(*A communication from Leopold Wiart.*)—This invention relates to a steam generating apparatus, which it is stated, ensures an efficient circulation of the water, prevents the incrustation of the heating surfaces, and superheats the steam it generates. The heating surfaces employed are rows of vertical tubes contained within furnace walls, and pendent from horizontal metal channels or chambers. The apparatus is divided vertically by transverse walls into three compartments. Under the first or steam-generating compartment, a furnace is fitted immediately below the tubes, which are closed at the lower ends and reach down to within a short distance of the fire-bed. The flaming products of combustion rise amongst the tubes, and enter the second compartment through an opening near the top of the division wall. In this compartment, which is fitted with vertical tubes suspended from chambers in the same manner, a current of feed water circulates in the tubes; the heated products of combustion entering at top from the first compartment take a downward course, and pass thence through an opening at the bottom of the second division wall into the third compartment, which also is fitted with tubes in the same manner, wherein the steam generated in the first compartment is afterwards superheated. In order to ensure a current or circulation within the tubes, they are each concentrically fitted with small inner tubes, which reach down towards the lower ends of the outer tubes, and extend at their upper ends considerably above them, so as to communicate with the highest chambers in the compartments of the apparatus, whence the water currents flow down the small inner tubes, passing up the outer tubes into the chambers above, which are suitably connected by valves and pipes, for inlet and discharge.

[Printed, 1*s*. Drawing.]

A.D. 1864, May 10.—N° 1183.

BUTLER, DANIEL.—(*Provisional protection only.*)—The object of this invention, which relates to "mechanical arrangements "applicable to steam hammers specially useful in the manufac-"ture of tin foil," consists in giving to steam hammers a backward or forward movement, in order that each successive blow may fall in a fresh place; it is described by the inventor as follows:—

"On the piston rod of the steam hammer I have an upper and "a lower stud, which are for the purpose of acting upon the "end of a tappet lever, the other end of which is secured to an "upright lever, the lower end of this latter having a lever secured "thereto at right angles, itself secured to a pall that takes into "a ratchet wheel, which is attached to a toothed wheel, the teeth "whereof gear with the teeth of a wheel secured on one of the "travelling wheels on which I have the machinery supported, "such wheels being flanged to travel on rails provided for them. "By these arrangements, after each blow of the hammer, the "upward movement of the piston rod causes the machine and the "hammer to move forward, so that the blow of the hammer will "fall in a fresh place each time of action. The hammer tip is "conical, and of such width as to cover the width of the work, "and the ends of this hammer tip work in guides. The above "arrangements might however be varied as regards the details "thereof according to the character of the work to be performed "by the hammer. The steam connection with the boiler must be "by flexible or jointed tubing, or by pipes which will permit of "the movement of the mechanism as described."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 10.—N° 1184.

ROWLAND, James.—The object of this invention, which relates to cocks, taps, and steam engine and other valves, is the construction of an equilibrium valve, to supersede the common slide and Cornish valves in ordinary use; it is adapted to work the steam ways in steam engine cylinders, and to open and stop the flow, in water and steam pipes. The interior of the valve case is coniform, wherein is fitted a conical plug, which is raised and lowered on its seat by various mechanical appliances, suited to the particular adaptation of the valve. For high-pressure water and steam pipes a lever or screw, working through a threaded hole in the cap or head piece, is a suitable arrangement, and to expansion steam valves for engine cylinders, levers may be used actuated by cams or tappets operated by an excentric on the engine shaft, or by means of a wedge or wedges, the valve spindle in all cases working through stuffing-boxes suitably packed. As soon as the conical plug is lifted from its seat, an annular space is formed between the plug and case for the passage of the fluid, and all the friction which occurs during the travel of the ordinary

slide valve is avoided. The plug and case instead of being conical, may take the form of the frustum of a pyramid or wedge.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1864, May 11.—N° 1190.

YULE, John.—(*Provisional protection only.*)—This invention relates to steam hammers; it is also applicable to pumping engines, having for its object the simplifying and rendering more automatic, the valve details and gearing upon which the action of a steam hammer depends. With slight modifications it is applicable as a pumping engine, rendering the fly wheel, usually employed in such engines, unnecessary. In one modification, the admission of steam to the top and bottom of the hammer cylinder, is regulated by a valve consisting of two pistons on a rod. The steam enters between the pistons; the area of one piston is made larger than the other, consequently the steam always tends to move the valve in one direction, viz., for lifting the hammer, which, when rising moves the valve in the opposite direction through the action of a lever, made adjustable for different lengths of stroke. When the hammer descends, the steam reverses the valve and causes the hammer to be again lifted. In adapting the arrangements to pumping engines, a tappet in connection with the piston rod, shifts the valve for the stroke in one direction, the steam shifting it for the stroke in the opposite direction.

[Printed, 4*d.* No Drawings.]

A.D. 1864, May 12.—N° 1198.

WILSON, Robert.—This invention relates to hydraulic and other presses, steam engines, and pumps for working them, or for forcing or raising fluids, to apparatus for hooping cotton and other bales of fibrous material, and to weighting safety valves.

Presses.—The grooved lashing plates are made separate, so that they can be detached from the top of the press, and from the piston follower or cross head to which the ram or rams are attached, for the purpose of being able to substitute other plates, furnished with any other required number of grooves, for either ropes or metal bands.

Describes a new mode of hooping or securing bales, and a method of constructing the glands of hydraulic presses, and securing the capped leathers.

Steam engines.—Regulating the motion of steam engines by a governor or regulator actuated by the pressure of the water in the pipes or pumps connected with the engine. The water pressure acts on a small piston, which by means of cross heads, levers, and rods, operates upon the throttle or steam valve of the engine, admitting and shutting off the steam in relation to the weight of water pressure, and in the proportion required to secure the constant uniform motion of the engine.

Safety valves.—Are weighted direct, by the tension put by screw nuts upon spiral springs attached to rods fixed to the ends of a cross head, which rests on the pointed end of the valve spindle.

Pumps or valve boxes.—Leather packings are dispensed with, and the top joints of the valve boxes are fitted metal to metal. The guards of the valve are made separate from the gland, and provided with a bearing or seat, on which like the valves they are ground and screwed down by the gland nut or otherwise, and thereby, without packing are kept water-tight against the pressure underneath.

Describes a mechanical arrangement for relieving (without stopping the engine) the pumps and pipes, when the pressure therein is not required.

[Printed, 2*s*. Drawings.]

A.D. 1864, May 12.—N° 1206.

BOULTON, Matthew Piers Watt.—(*Provisional protection only.*)—This invention relates to obtaining motive power by the pressure of steam or aeriform fluids upon the surface of water or other liquid, whereby a continuous stream of the liquid is produced, which may be employed for giving motion to a turbine, mill, wheel, or other hydraulic instrument. "The aeriform fluid " (steam, gas, vapour, or any admixture of these) is caused to " issue at a high velocity through an orifice into a larger channel " containing water or other liquid. Issuing in this way it acts " as the blast pipe of a locomotive engine, it drives forward the " liquid in front while on account of the diminution of pressure " the liquid behind is forced to follow. In this way a continuous " stream of liquid is established, the velocity and magnitude of " which will depend on the proportions given to the parts and " their mode of adjustment, whatever momentum is subtracted " from the issuing aeriform current is transferred to the current

"of liquid set in motion, except only that portion destroyed by "friction, and the friction is not wholly loss since it generates "heat which under the circumstances acts advantageously. The "channel in which the current of liquid is made to move may "vary in inclination, form, and size, and many channels may be "employed, whose adjustment may be varied in many ways." Other devices are proposed for raising and forcing the water or other liquid.

[Printed, 4d. No Drawings.]

A.D. 1864, May 12.—N° 1210.

FAIRLIE, Robert Francis.—The object of this invention, which relates to locomotive engines and boilers, is to obtain a large amount of tractive power without excessive pressure on the driving wheels; also to adapt the engine for readily turning short curves, and by similar arrangements at both ends, rendering it unnecessary at any time to turn the engine round. The boiler is mounted on the centres of two "bogie frames" each having four or more wheels, and one, two or more cylinders, each frame being a separate engine, united to the other and supplied with steam by one intermediate boiler. The wheels of each engine frame are coupled and driven by the engines respectively, so that although the collective tractive power will be great, it will be distributed in such manner as to inflict only the smallest amount of damage on the rails. The fire-box is disposed in the middle of the boiler, which is of considerable length, each end terminating in a separate smoke box, leading to which respectively from the central fire-box, there is, in the direction of each smoke box, a separate set of flue tubes. A chimney may be provided to each smoke box, but it is preferable that each section of the boiler be fitted with return tubes, through which the products of combustion, as also the exhaust blast from each engine section, will be directed to one common central chimney, disposed over the fire-box. The chimney if requisite may be divided, so as to provide an independent passage for the products of combustion from each section of the boiler. The steam pipes are fitted with ball and socket joint couplings, so as to permit of the altering relative positions of the engine frames respectively in relation to the boiler. The exhaust and feed water service pipes are also similarly provided, and for the same purpose. Foot plates are attached to each side, and coal bunkers for fuel extend along the boiler. The ash-pit

opens under each end section of the boiler, and can be closed in either direction by flap valves. The water tanks may occupy a portion of the side space, or be superposed over each end of the boiler. Instead of mounting the boiler on the engine or bogie frames, it is sometimes arranged partly to rest upon an intermediate frame, fitted with freedom to oscillate, whilst possessing at the same time the necessary amount of stability.

[Printed, 2*s*. Drawings.]

A.D. 1864, May 14.—N° 1227.

NEWTON, WILLIAM EDWARD.—(*A communication from John Jones.*)—This invention relates to rotary engines, which, it is stated, in consequence of the peculiar construction of the valves, are of the simplest description that will operate by the pressure of steam or gases. The engine consists of a cylindrical case, within which, concentrically mounted upon the central axis or shaft, is a cylindrical piston block or drum, which fills the cylinder to the ends lengthwise, but leaves an annular space between its periphery and the internal surface of the cylinder, along which two recesses are formed to receive the valves; along the surface of the cylindrical block a projecting piece is fitted, the sides of which in section converge towards each other in gentle curves from the periphery of the block to the apex of the projecting piece, where it is fitted with a packing strip which, when the engine is in motion, slides round in steam-tight contact with the internal surface of the cylinder. This projecting piece acts as the piston, and as it is driven round by the steam, a rotative movement is imparted to the central shaft. The valves are near together and act right and left for the inlet and exhaust; they are lifted by the curved sides of the piston piece and returned by springs. The working face of each valve is suitably bevelled and furnished with packing, which acts against the periphery of the revolving piston block.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 19.—N° 1263.

BAUER, WILLIAM. — This invention relates to self-acting governors applicable to stationary and marine, steam and other motive-power engines. These dynamometric governors are called into action by the decrease or increase in the resistance or load

without first permitting any notable change or variation in the speed of the engine. When applied as a regulator to marine engines driving a screw propeller, a cylinder is placed inside the vessel contiguous to the stern post and is by means of a pipe put into communication with the sea water outside, so that the level of the water in the cylinder varies in accordance therewith. Within the cylinder there is a float to which a toothed rack is attached, which, as the float rises and falls, actuates a tooth wheel; this wheel is fixed upon a shaft which works out through water-tight bearings into the open space in the hold of the vessel; upon the outer end of the shaft the necessary connections are fixed for reaching the throttle or other valve which regulates the supply of steam to the engine. Two modified examples of this governor are exhibited and described. The self-acting governors for stationary engines, as well as for marine engines, react by the elasticity of compressed air. The engine shaft and the shaft to be driven and regulated are rectilineally adjusted on the same plane. Upon the contiguous ends respectively of the two shafts are fixed bosses, each boss having two diametral radiating arms, the ends of which are furnished, one with a concentric socket or tube formed to the arc of a circle, and the other with a segmental bar piston of corresponding radius, and the bosses are so arranged on the ends of the shafts, that the two segmental bar pistons enter the curved tubes respectively through stuffing boxes fitted to the ends of each. When the engine shaft is set in motion, the pistons are forced into the tubes until the compression of the air within overcomes the resistance of the driven shaft which is then set in motion. Any reduction of the load upon the latter shaft will effect the relative positions of the curved tubes and pistons, which is availed of for actuating the connections with the steam valve, whereby more or less steam is supplied to the engine. Modifications of this part of the invention are also shown and described.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 24.—N° 1291.

BOULTON, Matthew Piers Watt.—This is an invention of improvements in engines worked by heated air or gases mixed with steam; it is also applicable to compressing air and other aeriform fluids. A combustion chamber is employed, wherein inflammable gas, vapour, or other fuel is burnt, the products fr-

opens under each end section of the boiler, and can be closed in either direction by flap valves. The water tanks may occupy a portion of the side space, or be superposed over each end of the boiler. Instead of mounting the boiler on the engine or bogie frames, it is sometimes arranged partly to rest upon an intermediate frame, fitted with freedom to oscillate, whilst possessing at the same time the necessary amount of stability.

[Printed, 2*s*. Drawings.]

A.D. 1864, May 14.—N° 1227.

NEWTON, WILLIAM EDWARD.—(*A communication from John Jones.*)—This invention relates to rotary engines, which, it is stated, in consequence of the peculiar construction of the valves, are of the simplest description that will operate by the pressure of steam or gases. The engine consists of a cylindrical case, within which, concentrically mounted upon the central axis or shaft, is a cylindrical piston block or drum, which fills the cylinder to the ends lengthwise, but leaves an annular space between its periphery and the internal surface of the cylinder, along which two recesses are formed to receive the valves; along the surface of the cylindrical block a projecting piece is fitted, the sides of which in section converge towards each other in gentle curves from the periphery of the block to the apex of the projecting piece, where it is fitted with a packing strip which, when the engine is in motion, slides round in steam-tight contact with the internal surface of the cylinder. This projecting piece acts as the piston, and as it is driven round by the steam, a rotative movement is imparted to the central shaft. The valves are near together and act right and left for the inlet and exhaust; they are lifted by the curved sides of the piston piece and returned by springs. The working face of each valve is suitably bevelled and furnished with packing, which acts against the periphery of the revolving piston block.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 19.—N° 1263.

BAUER, WILLIAM.—This invention relates to self-acting governors applicable to stationary and marine, steam and other motive-power engines. These dynamometric governors are called into action by the decrease or increase in the resistance or load

without first permitting any notable change or variation in the speed of the engine. When applied as a regulator to marine engines driving a screw propeller, a cylinder is placed inside the vessel contiguous to the stern post and is by means of a pipe put into communication with the sea water outside, so that the level of the water in the cylinder varies in accordance therewith. Within the cylinder there is a float to which a toothed rack is attached, which, as the float rises and falls, actuates a tooth wheel; this wheel is fixed upon a shaft which works out through water-tight bearings into the open space in the hold of the vessel; upon the outer end of the shaft the necessary connections are fixed for reaching the throttle or other valve which regulates the supply of steam to the engine. Two modified examples of this governor are exhibited and described. The self-acting governors for stationary engines, as well as for marine engines, react by the elasticity of compressed air. The engine shaft and the shaft to be driven and regulated are rectilineally adjusted on the same plane. Upon the contiguous ends respectively of the two shafts are fixed bosses, each boss having two diametral radiating arms, the ends of which are furnished, one with a concentric socket or tube formed to the arc of a circle, and the other with a segmental bar piston of corresponding radius, and the bosses are so arranged on the ends of the shafts, that the two segmental bar pistons enter the curved tubes respectively through stuffing boxes fitted to the ends of each. When the engine shaft is set in motion, the pistons are forced into the tubes until the compression of the air within overcomes the resistance of the driven shaft which is then set in motion. Any reduction of the load upon the latter shaft will effect the relative positions of the curved tubes and pistons, which is availed of for actuating the connections with the steam valve, whereby more or less steam is supplied to the engine. Modifications of this part of the invention are also shown and described.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 24.—N° 1291.

BOULTON, Matthew Piers Watt.—This is an invention of improvements in engines worked by heated air or gases mixed with steam; it is also applicable to compressing air and other aeriform fluids. A combustion chamber is employed, wherein inflammable gas, vapour, or other fuel is burnt, the products from

which possess great expansive force. A boiler is employed in which steam is generated. The heated gases and vapours issue from the combustion chamber into a receiver, where they commingle with the steam which enters from the boiler; or the heated gases and vapours may, through suitable passages, be conducted into the steam space of the boiler, and there combine with the steam, which combination is employed to work an engine. The exhaust passages conduct the vapours (which still retain considerable heat) from the engine to the boiler furnace, where (being inflammable when mixed with air) they are employed to generate the steam; they are also partially employed to generate inflammable vapour from petroleum, naphtha, or oils, which vapour is used in the combustion chamber as fuel. The air is forced into the combustion chamber by a pump, and the engine is started by the steam from the boiler, whereby the forcing apparatus is set in motion, combustion taking place under pressure within the chamber, which, as also the vessels connected with it, consist of strong pressure bearing metal casings lined with fire-brick.

[Printed, 1*s*. Drawing.]

A.D. 1864, May 25.—Nº 1300.

SHAW, George.—(*A communication from August Conrad Dewies.*) —(*Letters Patent void for want of Final Specification.*)—This invention, relating to apparatus for burning liquid fuel, is adapted to the heating of steam boilers, and is also applicable for heating stoves and other similar purposes. It consists in constructing and arranging a series of burners and deflectors or air conductors, either in concentric circles round the burner or otherwise, so that perfect combustion of the fuel, such as petroleum oil or other liquid hydro-carbon which is supplied to the burners, is effected in a continuous sheet of flame. As applied to a steam boiler, the reservoirs containing the inflammable fluid, are placed in or near the furnace or fire-box, inclosed in a casing and surrounded with water. A series of tubes horizontally arranged in concentric circles, communicates with the reservoir, a porcelain burner being fitted into each tube. Each burner is furnished with a wick, and by suitable appliances, all the wicks can be simultaneously raised or lowered. Air is brought into contact with the flame by means of coniformed deflectors, three of which are fitted concentrically round each burner. These deflectors or air conductors cause such

a draught of air, that the flame from each is so much expanded as to combine with the flame of the contiguous burners, and thereby produce a series of concentric sheets of flame. No air is admitted to the burners excepting through the deflectors, the flames being carried thence into the tubes and in contact with the heating surfaces of the boiler.

Arrangements for applying the invention to stoves and kitchen ranges are described.

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 27.—N° 1318.

BOUSFIELD, George Tomlinson.—(*A communication from William Judson.*)—This invention relates to the construction of surface condensers, with regard to an improved mode of fixing the ends of the tubes in the tube plates, for which purpose, around each of the holes made to receive the tubes, a recess is formed on the outside of each tube plate, and in each annular recess a packing ring, by preference of vulcanized india-rubber is deposited, one in each hole embracing the tube at each end. The tubes at one end are furnished with fixed collars and the other ends are screwed to receive an annular nut and loose ring collar. When the tube is adjusted in the tube plates and the nut is tightened up against the exterior of the plate at one end, it forces the ring collar against the packing ring, which is thereby bedded into the recess, and a fluid-tight joint is formed round the tube, at the same time that the fixed collar at the other end of the tube is drawn against the packing ring in the recess of the other plate, where a similar fluid-tight joint is also produced. The surfaces of the fixed collar and ring, which press against the annular packings, are under-cut, and the bottom of the recesses in the tube plates are formed to correspond.

[Printed, 6*d*. Drawing.]

A.D. 1864, May 28.—N° 1325.

LEES, John William.—This invention relates to cleaning and preventing incrusted formations upon the tubes of the feed water heating apparatus employed in connection with steam boilers. These tubes, which consist of a series, are placed in the flues. The passage of the feed water is through the tubes, which are externally exposed to the residue of heat contained in the products

of combustion on their way to the chimney. The object of the invention is to prevent and remove the formation of solid matter or incrustation, which is constantly forming on the surface of the tubes, by the use of jets or currents of steam, which may be applied and directed against the external surface of the tubes, by means of passing a steam pipe or revolving hollow shaft into the flue amongst the tubes. This pipe or shaft is furnished with lateral branches, the ends and sides of which are perforated; it is made to revolve by means of a wheel or otherwise, actuated by the attendant while the full force of the steam is issuing in jets from the arms or branches, whereby the deposits are removed from the exterior of the pipes, and a good portion of the heat of the steam is imparted to the current of feed water passing within them.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 30.—N° 1339.

HUGGETT, John. — This invention relates to a rotary engine, which is also applicable as a pump or gas exhauster. It consists of a cylinder or case having fitted longitudinally through its centre, the main shaft, concentrically upon which within the cylinder is fixed a solid boss which extends internally from end to end, abutting against the covers which are fitted with stuffing boxes through which the shaft revolves. The boss within the cylinder is partly surrounded by a circular space, and partly by solid metal, against which it works. These forms are concentric with the shaft, on the opposite sides of which, the ends of the inner circle formed by the solid metal diverge and unite with the outer circle and so form suitably curved piston guides. The piston plate which extends from end to end, works in a longitudinal mortice through the shaft and boss, and is caused to slide diametrally to and fro in the mortice by the curved guides, which are so fashioned, that the longitudinal edges of the diametral piston plate, whilst sliding through the shaft and boss, are always in contact either with the extremity of the two radii or with the curves. The steam admission port is on one side of the boss at one extremity of the space, and the exhaust port at the other; by sending the fresh steam through the exhaust passage, the direction of motion may be reversed.

[Printed, 8*d*. Drawing.]

A.D. 1864, May 31.—Nº 1350.

STANLEY, John Martin, and STANLEY, Jabez.—This invention relates to apparatus comprising, 1st, a rotary engine, to be worked by steam or other elastic fluid, and 2nd, a similarly formed engine, capable of being used as a water mill or hydraulic engine, and of receiving power through the cylinder, and transmitting it through the axis, or receiving power through the axis, and transmitting it through the cylinder, as may be required for moving, raising, or forcing water, exhausting, compressing, or blowing air or fluids.

The rotary engine consists of an inner revolving cylinder, which is mounted or fixed upon a horizontal central axis or shaft, which passes so far eccentrically through the ends of a fixed cylindrical outer case, as to bring the periphery of the inner cylinder against one part of the internal surface of the case, which is there fitted longitudinally with a packing strap, against which the surface of the inner cylinder revolves in constant steam-tight frictional contact, so that at all parts of the revolution a crescent formed space exists between the inner cylinder and the case. Stuffing boxes eccentrically fitted on the ends of the case, act as bearings for the shaft. Diametrally through the inner cylinder and through the shaft there is a longitudinal narrow mortice or opening, which extends towards the ends of the cylinder, and in this mortice a plate piston, suitably packed, is fitted to slide diametrally with its ends in constant contact with the inner surface of the case, the configuration of the transverse section of which, is necessarily caused slightly to deviate from a true circle. Ports or apertures, for the steam and exhaust, open into the case on each side of the packed line of contact between the case and inner cylinder. The passage of the steam through these ports is regulated by a valve, and in accordance with the required direction of motion, they are made to answer respectively either for the induction of the steam or for the exhaust.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 31.—Nº 1351.

FOWLER, John, and WEBB, Thomas.—This invention relates to common road steam carriages and portable steam engines, the steam for which is generated by the combustion of coal or other inflammable gas, which is contained in a reservoir mounted on a

separate pair of wheels coupled to the engine; the reservoir may be disposed on the engine frame; it contains an inverted air-tight bag corresponding in size with and secured round the bottom of the reservoir; upon this bag a piston plate is placed and secured thereto; the plate corresponds in size and form with the superficial area of the reservoir, fitting loosely therein between guides, which cause it to rise and fall in a horizontal position. When required to be filled, a service cock attached to the bottom is coupled to a branch from a gas main. The pressure on the gas raises the piston plate until the bag is filled; when the supply is shut off, the weight of the plate upon the bag is sufficient to expel the gas with the requisite amount of force. The furnace bars are covered with a stratum of fire-brick broken in small pieces; the gas is supplied underneath, which along with a regulated quantity of atmospheric air, rises through the bed of broken fire-brick and burns on the upper surface; no fire-box is required, a short chimney being sufficient to insure a draught through the tubes. Instead of gas, petroleum or other oil may be converted into gaseous fluid by passing it through a heated pipe, which is effected in regulated quantities by a force pump. The invention also relates to a mode of condensing the exhaust steam by currents of cold air passing through a numerous group of tubes contained in a condenser case; the steam exhausts into the case amongst the tubes, upon the surface of which fine jets of water are thrown by means of a force pump in communication with the upper part of the tank. A substitute for the steam blast up the chimney is supplied by a fan, which also forces air into the closed ash-pit to mingle with the gas.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, June 2.—N° 1376.

NEWTON, William Edward.—(*A communication from William Lighthall.*)—This invention relates to apparatus for cooling the injection water of marine engines, and consists of a rectangular oblong case, constructed with metal plates bolted together; a chamber is formed across each end by tube plates, the edges of which are properly fitted and secured against the sides of the case so as to be water-tight. Numerous small tubes extend between these plates and form a direct communication between the end chambers, in which at one end, through a large pipe attached to

the centre, the current of cooling water enters and courses through the tubes into the chamber at the other end, and thence away through a large pipe attached thereto. The injection water takes a lateral course between the tubes; it enters at one end of the tube chamber through a pipe attached to the side of the case, and by means of longitudinal diaphragms and transverse division plates, which only fit against three sides of the case, and alternately fall short of the fourth, the heated injection water is made to traverse the various sections of the apparatus from side to side, crossing and recrossing amongst the tubes containing the cold water a number of times, until it finally leaves through a side pipe at the opposite end of the tube chamber; this pipe is in communication with the condenser, where it conveys the water then in a cool state, to be re-injected. The injection water and the cooling water course through the apparatus in opposite directions. 2, consists in obtaining a current of sea water through the tubes and apparatus by means of "shutes" which are so placed outside the vessel, that, as she moves forward, the water is constrained to enter and having passed through the apparatus, leaves the vessel through an opening further astern. 3, consists in arranging the delivery pipe from the hot well, and the feed pipe thereto from the pump, in such relation to each other, that the amount of injection water used during the preceding revolution of the engine, shall first be returned to the refrigerator to be cooled for re-use, and the remainder of the water raised by the air pump, which is the result of the condensation of the steam used to effect the revolution, shall be returned to the boiler. 4, consists in securing the tube ends in the tube plates by the use of a ductile metallic packing, secured round the tube ends within an enlargement made a considerable depth in the holes which are formed in the tube plates to receive them.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, June 3.—N° 1379.

LEE, Joseph William. — (*Provisional protection only.*) — This invention of improvements in traction engines for ploughing, threshing, and other purposes, is supplementary to former Patents granted respectively to Joseph Lee and Benjamin Dutton Taplin, dated 27th May 1861, No. 1331, and to Joseph Lee and William Lee, dated 4th October 1862, No. 2678. The present

invention consists, 1, in combining and arranging in the construction of traction engines, that the sliding axle, described in the Specification of 1861, upon which the chain wheel is made fast, is to be supported by two brackets securely fastened to the front of the fire-box end of the boiler, and two carriages, bolted on the brackets are to be fitted upon the bearings of the axletree. In the brackets and upon the carriages, slots are to be made to allow the carriages liberty to move five or six inches either forward or backward for the purpose, by means of adjusting screws, eccentrics, or otherwise, of tightening the chain. 2, with regard to the Patent of 1862, the present invention relates to that part immediately connected with the countershaft placed under the body of the boiler, and consists in placing it parallel with the main axle, and mounting thereon two spur pinions and a pitch chain pinion for the purpose of giving motion to the driving axle, and free action to steel or india-rubber springs. 3, fitting upon the main axles, for use in case of need, a grooved or flanged wheel or drum, provided with a steel wire rope or chain, for hauling the engine along headlands or out of soft places, or for hauling up inclines. 4, connecting the driving wheels to the axles by means of friction plates, which consist of an external and internal ring plate, placed upon each side of the nave of the wheels, which are made fast or loose by drawing the plates together by means of bolts or otherwise. 5, consists in the use of a spiral or volute spring, or one of india-rubber, fitted into a recess in the front bed plate, whereupon to rest the end of the boiler. 6, enclosing and covering the fly wheel, so that horses may be passed without alarm or danger, and 7, consists in the use of an auxiliary cylinder fixed to a carriage placed next the traction engine. This cylinder is supplied with steam from the boiler and is so connected by gearing as to be capable of actuating the hind wheels of the carriage when ascending steep gradients.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 10.—N° 1445.

JAMES, William Henry.—This invention relates to a motive power engine actuated by high-pressure steam combined with compressed air. Two single action cylinders acting on one crank *shaft*, the throws of which reciprocate motion on the same plane at opposite sides of the shaft, are shown and described. The

length of stroke is unusually long, in order to carry the pistons into perforated prolongations of the cylinders at the end of the upstroke of each. By this arrangement the atmosphere is admitted into the cylinders underneath the pistons respectively and is compressed as they return and finish their downward stroke, after which the lower ends of the cylinders have capacity left to contain the compressed air, amongst which, simultaneously with the finish of the stroke, the high-pressure steam is admitted and commingling therewith, the reactive power of the air is increased by the additional expansibility it obtains from the high temperature of the steam, the force of the combination acting expansively upon the pistons to produce the up stroke. The valves are operated by the pistons, which at the end of their strokes respectively strike the tail ends of and open the inlet valves. It is proposed to pass the exhaust from the cylinders into the boiler furnace to assist in the combustion of the fuel. Stop cocks or slide valves, actuated by eccentrics or otherwise, may be substituted for the inlet valves for the purpose of introducing the steam.

[Printed, 8*d*. Drawing.]

A.D. 1864, June 13.—Nº 1463.

MARSHALL, James Garth.—This invention relates to apparatus for generating steam, whereby (it is stated) a perfect circulation of the water is maintained, and the steam immediately it is generated escapes from the surrounding water to the steam space. The form of the generator is somewhat square, containing a furnace of similar form, with a flat roof or top; it is surrounded with water space, and open underneath to the ash-pit. The fire-door entrance into the furnace is formed through the front wall or water space, and the exit passage for the products of combustion through the back. The top of the furnace is furnished with a number of syphon formed pipes or tubular bends, which communicate with the interior through the top of the furnace, and descend various depths in pendent loops towards the fire-bed. The furnace top forms a tube plate for the ends of the tubular bends, which are fixed therein; one end of each bend terminates just above the tube plate, and the other end passes up into the water space and terminates at a higher level, in order to induce a constant and independent circulation of water through each syphon tube. When straight single tubes are employed, each

tube is closed at the lower end and is longitudinally divided by a diaphragm to within a short distance of the bottom, where the diaphragm is suitably bent to direct the upward course of the steam. The side of the tube, which discharges the circulating water above, is arranged to do so at a higher level than the entrance opening into the other half. Within the water space (surrounding the furnace) partitions are also provided to produce a proper circulation of the water in those parts of the apparatus.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 15.—N° 1473.

O'NEILL, PATRICK BENIGNUS.—The object sought by this invention, which relates to sluice and other cocks, taps, and valves, is the production of more efficient apparatus for opening and closing pipes and ducts for the passage of water, steam, gas, and other fluids and vapours, for measuring and indicating the passing quantity, preventing leakage, and so improve the form and construction of such apparatus, as to render it less liable to derangement and injury.

In "the production of a common tap, I form the main trunk "or body of the tap in two parts, each of which consists of a "hollow cone. I join the larger ends of these cones together by "flanges formed thereon, or by screws, or any other suitable "means, thus forming a straight pipe or duct tapering towards "each end; one of these ends is fitted with a filter, or is per- "forated for being inserted into the vessel or barrel, and the "other end bored out and fitted with an inner hollow bell- "mouthed cone closed at the smaller end, but having an aperture "in the side; this inner cone forms the plug or valve of the tap, "and in the side of the outer fore cone I also form an aperture "surrounded by a short curved angular or dipping pipe or nozzle; "this piped aperture corresponds with the opening in the side of "the hollow plug before mentioned, by turning which plug the "passage through the tap is opened and closed."

It is proposed to introduce in the construction of taps and similar articles, a vent pipe, which turns with and is opened and closed by the turning of the plug, so that the liquor and vent passages are opened and closed simultaneously.

The cases of steam cocks are cast in one piece, and fitted with *the hollow* bell-cone plug with side opening. The end of the

plug passing through the end of the body or outer cone, is fitted with a lever or key for turning, a screwed stuffing box, and an adjusting screw and gland or collar for slacking and regulating in case of need. Another modification of steam cock is described, and also a variety of taps and valve cocks, including metrical taps and gauge cocks.

[Printed, 2*s.* 6*d.* Drawings.]

A.D. 1864, June 15.—N° 1478.

TAYLOR, Charles, and DOW, John.—This invention consists of apparatus for working the valves of steam engines by means of one eccentric for each valve, equal in effect to two eccentrics and a link motion; the steam is also worked more or less expansively or otherwise. The eccentric is so mounted on the face of a block or centre piece keyed on the crank shaft, that it has diametral liberty to slide. A rod connected to the strap of the eccentric leads direct to the valve rod. Upon the shaft, a short distance from the eccentric block, is mounted a piece similar in action to the driving half of a clutch, and like it with liberty to slide upon a feather longitudinally fixed in the shaft; around this piece there is a groove, made to receive the forked end of a lever, whereby it can be made to slide towards or from the eccentric. On the side next the eccentric the sliding piece is furnished with a projecting boss, which is embraced by the forked end of a link; the other end of this link extends towards the periphery of the eccentric, near to which it is attached by a joint pin to suitable knuckles projecting therefrom. The diametral sliding action of the eccentric is effected by the link, which alters its position in relation to the line of the shaft, according to the distance between the eccentric and the sliding piece; this distance is controlled or regulated by the forked lever, which at its outer end is actuated by a screw, by means of a hand wheel within reach of the engine driver, who by these means can, by shifting the eccentric, produce a corresponding change in the position of the valve. Modifications are described.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, June 15.—N° 1485.

FLETCHER, Joseph, and BOWER, Henry.—This invention relates to apparatus for feeding boilers and forcing fluids. It is

supplementary to a previous invention, for which letters patent were granted to these inventors bearing date February 3, 1863, No. 304. According to the present invention, the apparatus is so constructed, that the supply of both water and steam may be regulated by one motion, also lubricants, which liquify by heat, may be supplied by the apparatus to the boilers. The central pipe or steam passage, into which the steam enters by a lateral opening, is fitted with a stuffing box at the inlet end, into which a spindle is introduced, which extends along the centre of the passage. Upon this spindle is fixed a screwed collar, which takes into threads formed in a tube fitted to slide in an internal stuffing box. The area of the steam passage is increased or diminished when, by means of a hand wheel upon the spindle, the latter is caused to turn, whereby more or less space is produced between the outside of the conical tube and the conical end of the injection chamber; the tapering end of the tube is polygonal, and by preference twisted to favor the natural tendency of the water flow, which is supplied by an inlet pipe, and passes through a spiral passage to the injection chamber, opening into which, on one side of its narrow neck, is a vacuum valve, and opposite thereto an opening is provided for fitting a tallow cup. By turning the spindle in one or other direction, the supply of steam is increased and the water correspondingly diminished, and vice versa. It is stated, these adjustments act with great nicety. Slight modifications are suggested.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 16.—N° 1497.

GEDGE William Edward.—(*A communication from Arthur de Montméja.*)—(*Provisional protection only.*)—This invention relates to oscillating steam engines, and consists in the mode adopted for distributing the steam and reversing the action. The piston acts direct upon the crank shaft, which carries one eccentric for the feed pump and a grooved pulley for the regulator. The pump may also be worked from the trunnions, which project a little beyond the bearings. One of the trunnions, larger than the other, contains a conical socket or cavity, which is fitted with a key or plug in form of a truncated cone, ground to fit each other. Two passages open out of the cavity through the opposite sides of the trunnion and communicate by pipes respectively with

the ends of the cylinder. The conical plug contains two steam ways, one for supply and the other for exhaust, and according to the fixed position of the plug (as either one or other is brought into use as the inlet passage) so will the direction of the motions of the piston be controlled, the distribution of the steam being regulated by the oscillations of the cylinder. Double cylinder engines are constructed upon this principle, with one steam supply pipe common to both. It is proposed to apply the invention as a feed pump, the barrel terminating in a cock, the handle of which is in connection with a float contained in the boiler, whereby, according as the level of the water rises or falls, the feed shall be regulated in relation thereto, and when in excess shall be returned to the tank.

[Printed, 6*d*. Drawing.]

A.D. 1864, June 17.—N° 1512.

BENNETT, Joseph Jeffrey.—This is an invention of a pile driving apparatus, which is actuated by a small high-pressure steam engine combined therewith. The hammer weight or driver slides between two vertical guides, which in the usual way, also form the front supporting pieces of the top or head framing, whereon rests in suitable bearings, the spindle which carries the chain pulley. The lower ends of the front vertical guides, and also the inclining back and other supporting or shore pieces, are fitted into a base frame, which, held by a central pin, revolves on the platform of a low carriage which is mounted on wheels. Fitted upon the base frame, there is a steam winch worked by the connecting rod of the small steam engine, which is disposed and fixed at a suitable angle. Another chain pulley is mounted in the winch frame, and actuated by the gearing which is turned by the engine. The chain which lifts the hammer weight or driver is endless, passing up between the front vertical guides, over the top pulley, and down round the winch pulley; its motion in that direction being continuous. Fitted into a recess in the back of the hammer weight, is a strong cranked catch, which by means of a cord, when pulled by the attendant, is made to engage in a link of the chain, whereby the weight is gradually raised between the vertical guides towards the top of the apparatus, where, at a regulated distance, by means of a projecting bowl [illegible] n a[illegible] adjustable sliding piece, the chain is forced o[illegible]

catch, which is withdrawn instantly into the recess, and allows the hammer weight to fall upon the pile.

[Printed, 10*d.* Drawing.]

A.D. 1864, June 20.—N° 1529.

BEATTIE, Joseph Hamilton.—(*A communication from Joseph Marks.*)—This invention relates to the use of an anti-incrustation composition or powder for the prevention and removal of incrustation in steam boilers. The composition consists of 25 parts by weight of muriatic acid, 25 parts by weight of ammonia, 33 parts by weight of the pure salt of the native sugar cane, and 17 parts by weight of mahogany dust, compounded in the following manner. First mix the muriatic acid and ammonia and thoroughly pulverize the salt obtained, which mix with the pure salt of the sugar cane, also pulverized, and then add the mahogany dust, mixing the whole well together. When applied to remove the deposit from a locomotive boiler thickly incrusted, introduce 1½ lb. of the powder, and blow off the boiler and wash out after twelve hours work; then for twelve successive days introduce per day 1 lb. of the powder in the feed water tank, blow the boiler off every second day, and wash it out every third day. It is stated the above quantity is sufficient to clear any such boiler of incrustation and prevent its future formation. By introducing into the feed water ½ lb. of the powder on every working day, boilers may be kept free from all incrustation. The inventor does not confine himself to the precise proportions of the various ingredients, as stated in his specification.

[Printed, 4*d.* No Drawings.]

A.D. 1864, June 22.—N° 1553. (* *)

SPENCER, George.—(*A communication from Joseph Marks.*)—(*Provisional protection only.*)—" The blast pipes and chimneys of " locomotive and other steam engines," are set " as near to the " bottom of the smoke box as possible." A conducting pipe is arranged with an open space around the top " placed either " between the pipe and top of smoke box or between the top of " the lifting pipe and the chimney." Its bottom end is made of a bell mouth shape " so as to receive the escaping gases from " the bottom part of the boiler," and also guide " the exhaust " steam in a direct line through the top chimney."

[Printed, 4*d.* No Drawings.]

A.D. 1864, June 23.—Nº 1573.

CLARK, WILLIAM.—(*A communication from William Loughridge.*)—This invention relates to a system of railway brakes extending throughout the train and operated by steam power.

1st. The employment of a steam cylinder with piston, steam chest, and valve horizontally disposed at the after part of the brake carriage or engine, beneath the driver's platform. The valve stem is provided with a foot-piece, which, when pressed upon by the foot of the engine driver, opens the exhaust valve and relieves the brakes. The necessary tension for actuating the longitudinal connecting rods, and bringing the several brake blocks into frictional contact with the wheels, is caused by the pull of a brake chain, which passes over pulleys arranged to act conversely to the ordinary mode of using blocks and tackle. The steam valve "is connected with a lever which receives a portion of the " pressure afforded by the steam within the cylinder, and a spring " that weighs the necessary power required on the brakes, all " being arranged . . . . . that the brakes may be subjected or " graduated to any degree of pressure which may be necessary or " desired, and the communication between the boiler of the loco- " motive automatically opened and closed so as to render the " desired pressure constant, whether the same be more or less."

2nd. Relates to the escape valve employed, which is so arranged as to obviate any sudden pull on the brake chain, and also to " exhaust the cylinder when the brakes are to be relieved."

3rd. The arrangement of the chain and pulleys, whereby the necessary length of pull is imparted to the brake chain by a short movement of the piston,

4th. " A mode of weighing two friction plates together on a " shaft or chain barrel for the purpose of regulating the pressure " on the brakes to any degree the engineer or brakesman may " desire, the plates when said pressure on the brakes is obtained " being allowed to slip, and the pressure held or retained by a " pawl and ratchet."

5th. Employs a ratchet and pawl, and a spring and a lever or other suitable device in combination with a hand brake windlass for the purpose of preventing sliding of the wheels, as well as to ensure a necessary retarding effect upon the carriage in proportion to the load.

6th. Consists in arranging and connectin

that the brakes may be actuated by hand gear as well as the steam power, either simultaneously or separately by each as may be required.

[Printed, 1s. 6d. Drawings.]

A.D. 1864, June 23.—N° 1584.

CROWE, DANIEL.—This invention, relating to the application of power to compound portable thrashing and dressing machines, consists in combining a steam engine therewith, in order that the machine and engine form one carriage, which, when intended to be locomotive, is either actuated after the usual manner of giving motion to traction or other locomotive common road carriages, or is so constructed as to admit of its being drawn by horses. The thrashing and dressing machinery is constructed and arranged as heretofore, preparation to receive power from the engine being made in the form of strap or band pulleys, or tooth wheels. The engine is placed at one end of the combined machine, and the boiler extends beneath it, so that the length of the machine is not much increased. The back end of the boiler is suspended from the framing by an iron strap, and the front end is supported on the axle of the hind wheels, which is cranked down for the purpose. The boiler is otherwise supported by side plates attached to the framing, which together aid in supporting the front of the boiler and the engineer's platform. The furnace is disposed in the vertical part of the boiler and communicates with fire tubes in the horizontal section, which extends beneath the machine. After passing the bridge, the products of combustion course through these tubes into a chamber at the end, whence they return by larger tubes to an inclined passage leading through the upright section of the boiler to the chimney. The cylinder and working parts of the engine, with the crank shaft above, are attached in a vertical position low down to one side of the vertical part of the boiler. Motion is given off the crank shaft to the functional parts of the combined machine by means of bands or straps and pulleys. When required to move the hind wheels, which are furnished with internal gearing, they are actuated by pinions, which at any time by means of hand levers and friction wheels in connection with the crank shaft, can be brought into activity.

[Printed, 10d. Drawing.]

A.D. 1864, June 24.—N° 1587.

SIMS, George Timothy, and PENDLEY, John.—(*Provisional protection only.*)—This invention relates to a composition for preventing and removing incrustations in steam and other boilers, which consists of equal parts of powdered charcoal, common soda, and alum, mixed together and combined with wood dust. It is stated, the composition thus obtained, when placed in a steam or other boiler, will prevent the formation of incrustation if the boiler is clean, or cause its removal if previously incrusted.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 25.—N° 1597.

HENRY, Michael.—(*A communication from Léon Foucault.*)—(*Provisional protection only.*)—This invention relates to ball governors and is supplementary to a patent bearing date December 30, 1862, No. 3479, which invention was communicated by the same Léon Foucault to William Clark, who obtained the Letters Patent. The object of the present invention is to render the governor isochronous, which depends upon very simple relations between the work of the weights or springs, or both, and the movement of the collar. "The general condition of " isochronism in a governor is this, that the work of all the " weights and counterweights or springs (or both weights and " springs) of the apparatus shall be proportionate to the square of " the movement of the collar reckoned from the point of sus" pension. An exact application of this principle requires that " the two arms shall be suspended from the same point of the " spindle, that the collar shall be suspended from a single point, " and that the connecting arms which carry it shall form with the " weighted arms a perfect or equilateral four-sided figure. These " conditions having been observed, the only other requisite con" dition is the employment or intervention of a counterbalanced " weight, which shall exert on the collar a pressure increasing " uniformly with the height of the collar reckoned from a point " selected ad libitum on the axis of rotation." In illustrating the principle of the invention various examples of ball governors are shown and described.

[Printed, 6*d*. Drawing.]

A.D. 1864, June 25.—N° 1599.

STEVENS, Benjamin Franklin. — (*A communication from Simon Stevens.*)—This invention relates to obtaining motive power, heat, and light, from petroleum, coal, oil, and similar substances.

1st. It is proposed to vaporize in any suitable vessel by the application of heat, either crude or refined petroleum, or other similar fluid, and by means of a blowing apparatus, mix air, or air and ordinary or superheated steam therewith, either in the vaporizing vessel or otherwise. When necessary to regulate very accurately the relative quantities of the hydrocarbon vapour and the air, or the vapour, air, and steam, they may each be brought through a separate pipe and passed through a meter. When used as fuel under a steam boiler, the jet of steam may be commingled with the hydrocarbon vapour and air during the process of combustion, wherefrom a flame of large volume is obtained, filling and heating equably all the tubes and fire spaces of the boiler. For lighting purposes, when a brilliant steady light is required, a cone or shell of platinum gauze may be made to envelope the flame, and by regulating the supply of the inflammable vapours, so as to reduce the flame within the gauze, the latter immediately attains a bright white heat, and emits a brilliant light.

2nd. Consists in using the combined vapour as fuel for roasting, desulphurizing, and smelting ores. Many plans may be devised for the practical application of the invention to this purpose. The burners should be arranged in series, so as to furnish the required amount of heat and breadth of flame. One mode consists in allowing the ore in a powdered state, to fall into the flame produced by a row of burners, or the fine particles of ore may be directed into the flame by a current of air. Other contrivances for effecting the process are proposed.

3rd. Relates to the use of the products of combustion, under pressure, of the combined vapours, to actuate a piston in a cylinder. The combustion may be effected in the engine cylinder, or in a contiguous closed vessel or combustion chamber.

[Printed, 6*d*. No Drawings.]

A.D. 1864, June 28.—N° 1620.

CLARK, William. — (*A communication from Jean Baptiste Miguet and Pierre* Boissilier.)—The object sought by this inven-

tion, which relates to boilers, steam generators, and furnaces, is the complete combustion of smoke and increased generation of steam.

It "consists in reversing the ordinary mode of producing com-"bustion by creating a draught under the bars through which "the flame and heated gases pass, and introducing the air "necessary for the combustion above the fuel, through which it "penetrates and mixes with the gases of distillation, and also "with the particles of carbon in suspension, which together with "the gases form the smoke. The gases and carbon or smoke, "in order to pass beneath the bars, necessarily traverse the "incandescent surface of the coal, where they are burnt in "the completest manner possible; the necessary conditions for "producing perfect combustion being united, viz., an intimate "mixture of the body to be consumed with the necessary amount "of air and an elevated temperature."

"The improved furnace for obtaining this result is furnished "with a fire open to the atmosphere, and having a draught "through the bars only; the ash-pit is closed, but communicates "with the draught; the fire-bars are also hollow to permit of the "circulation of the liquid to be heated, and prevent injury to the "metal by heat."

The furnace is open in front but closed at the back end, and the ash-pit is closed in front and opens at the back into the flue. The ends of the hollow fire-bars are set into two hollow transverse bearers, one in front, which forms the dead plate, and the one at back carries the brick work which closes the end of the furnace. These hollow bearers and bars are connected at suitable levels with the water spaces of the boiler, so that a constant flow is passing through them. The air enters the front of the furnace in regulated quantities, and takes a downward course through the burning fuel and between the fire-bars into the ash-pit; thence it passes out into the flue, being directed upwards by the bridge.

[Printed, 8*d*. Drawings.]

A.D. 1864, June 29.—N° 1621.

HIDE, William.—(*Provisional protection not allowed.*)—The object of this invention, which relates to "boilers for generating "steam and consuming smoke," is to increase heating surface in boiler furnaces, increase water space, and so deflect the smoke i-

the furnace as to bring it into contact with the partially burnt fuel, and thereby cause its consumption. For these purposes, one or more plates or partitions are fitted to project into and so divide the furnace chamber as to bring the smoke evolved by the fresh fuel into contact with the surface of that portion of the fuel which is partly consumed, the heating surfaces and water space being proportionately increased thereby; and in order to secure a supply of air to the fire, the furnace doors, by the intervention of a projecting piece, are not allowed to close.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 29.—Nº 1626.

CLARK, WILLIAM. — (*A communication from Aristide Paul Blanchet.*)—(*Provisional protection only.*) —This invention relates to the application of steam for the cultivation of land and consists 1, Of a strong framing which carries the various parts. 2. A steam engine of about 10 horse-power, comprising a boiler and two cylinders, one on each side of the fire-box, inclining downwards in the direction of, 3, a crank shaft transversely disposed underneath the boiler and connected with the pistons and cylinders; on this shaft, which gives off the power, there are loosely mounted, one on the centre and one at each extremity outside the framing, three chain pinions which can be made fast by means of clutches. 4. Two large hind wheels mounted on spring axles, and two smaller in front which turn on central pivots; the peripheries of these wheels are made with cross ribs on broad felloes to prevent slipping or sinking into the land. Fixed mid-length on the axis of the large wheels there is a chain wheel, which by means of an endless chain, obtains motion from the central chain pinion on the crank shaft, and thus drives the wheels when locomotion is required. The small wheels support the fore end of the machine and, by means of suitable gear actuated by steering arms, they are turned to the required position and so made to guide the machine. 5. A cylindrical winding drum is transversely disposed low down at the back of the boiler, its shaft or axis resting in bearings bolted underneath the side framing, outside which, on each end of the drum axis, there is a chain pinion which, by means of endless chains, obtain direct motion from the chain pinions which are mounted on the ends of the crank shaft; upon the drum is wound an iron wire cable, to the free end of which is attached the *lough or ins*trument of culture. 6. A frame or anchor is fixed

to the back of the machine; it has three flukes or spurs trailing upon the surface when the machine is in motion, but which, when the hauling tension is on the rope, sink into the ground and so stop any tendency in the machine to move back. The other usual appliances, such as water tank and fuel box, feed pumps, steam and water pipes, water gauges, safety valve, and steam whistle, are supplied and conveniently disposed. The operation of the machine alternates with its own locomotion; when placed in a stationary position, the driving wheels by means of a lever operating on the central clutch, are thrown out of gear and the drum set in motion; as the rope is wound on, the implement is gradually drawn towards the machine, ploughing or tilling as it comes along; when fairly up to the machine, the drum pinions are placed out of gear with the crank shaft, and the driving pinion thrown in, which causes the machine to move on, and leave the implement in the ground which thereby draws the rope off the drum, then free to revolve in either direction; when the machine has taken up another position, the driving wheels are again thrown out, the drum is again brought into operation, and the implement hauled another stage, and so on, the power of the machine being alternately employed in effecting its own locomotion and hauling the implement.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1864, June 30.—N° 1636.

BOULTON, Matthew Piers Watt.—This invention relates to obtaining power from aeriform fluids. Hitherto the employment of such fluids, when highly heated, to operate the piston in an engine cylinder, has been attended with difficulties, to obviate which it is proposed to attach to the piston rod below the piston, a cylindrical vessel containing water, which vessel nearly fits but does not touch the cylinder, so that only a small portion of air or gas can find its way into the space between, where it is cooled by contact with the metal of the vessel, kept cool by the water or liquid within, which is introduced through the piston rod; the vapour generated within the vessel may be discharged or utilized. The vessel may be as long or somewhat longer than the stroke of the piston; the heated gases never enter the upper part of the cylinder. The cooling influence of the vessel may be regulated by introducing into its construction a material which obstructs the passage of heat. The exterior of the cylinder may be cooled by

encompassing it with a water jacket and the internal portion, to which the heated gases have access, may be lined with a bad heat-conducting substance. Both ends may be lined if the cylinder is double acting. The valve (which may either slide or rotate) is a metallic vessel containing water or other liquid introduced through the rod; substances slow to conduct heat should be used in the construction of and about the valve; a second valve may be employed to protect the main valve. The heat of the gases may be reduced by the introduction of steam. "After an inflammable gas "or inflammable vapour, such as vapour of petroleum, has been "burnt in a combustion chamber with a mixture of air, oxygen "or other suitable gas, the gaseous products of combustion may "be forced into water passing through it in numerous small "streams, which may be made to take a ziz-zag course by passing "in contact with metallic surfaces suitably disposed in the water "so as to generate steam, and the resulting mixture of heated "gases and steam may be used for the production of motive "power." Valves may be worked by an electro-magnet. Instead of employing heated gases to work a piston in a cylinder, such gases may be employed to work a turbine or similar instrument in a chamber constructed with a view of utilizing the heat by imparting it to water in a boiler. An artificial liquid current may be created for driving a wheel or turbine, by discharging in continuous issues or successive blasts aeriform fluid at a high velocity into the liquid in the direction that it runs.

[Printed, 1s. Drawings.]

A.D. 1864, July 2.—N° 1654.

CRAIG, WILLIAM GRINDLEY.—(*A communication from Michel Turck.*)—(*Provisional protection only.*)—This invention, relating to feed apparatus for steam boilers, is supplementary to a prior communication from Michel Turck to this patentee, who obtained Letters Patent for the same, which bear date May 1st, 1863, No. 1098. The present invention consists 1, in so arranging and combining the parts of the apparatus described in the previous Patent "that the orifice of the steam funnel is placed outside or "free of the conical part of the steam and water mixing tube "instead of inside or within such conical part as has heretofore "been the practice; the water regulator is also outside of the tube, "and the water is regulated by bringing the regulator nearer to, "or even in contact with, the inner surface of the mixing tube.

"This particular arrangement and combination of parts allows of "the contraction of the stream of water, lessens friction, and "enables the apparatus to be made shorter than heretofore."
2. "Consists in forming the spindle or valve conical upon the axis "which guides the steam in the corresponding part of the steam "funnel when the spindle is drawn back to cause the suction. "This arrangement as well as the former facilitates suction."
3. "Consists in varying at will the orifice of the steam funnel in "order to regulate the quantity of steam necessary to the working "of the apparatus at greatly varying pressures. For this purpose "the diameter of the orifice is increased, and this increase is "compensated by the conical prolongation of the spindle, so that "by inserting this conical part more or less in the steam funnel, "greater or smaller annular sections are produced in the orifice."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 5.—N° 1663.

PALMER, George Holworthy.—This invention relates to "heating and evaporating liquids and fluids, and consists in a "more complete and perfect method of applying and consuming "the fuel employed." It is described and illustrated as applied to various kinds of steam boilers. In some of these, the furnace or fuel chamber is surrounded by water space and contained within the shell of the boiler; in others, the fuel chamber is built in front. The grate which contains the fuel is in the form of a basket with flat bottom and sloping sides formed with bars or perforated plates containing water space. The ash-pit is closed, and the air necessary to effect the combustion of the fuel and inflammation of the gases is mechanically forced therein. The fuel fills the basket grate and is piled upon it, filling up against the closed sides of the chamber, and forming altogether a burning mass of unusual thickness, being from 30 to 36 inches deep. It is admitted from a hopper, being first lodged upon a horizontal shelf inside the furnace, where it is allowed to remain until it is coked, when it pushed forward upon the burning mass, over which, by means of distributing pipes, streams of air are admitted from the ash-pit, collectively of sufficient volume to reconvert the carbonic acid gas, which is first produced and afterwards chemically changed by combination with an additional volume of carbon whilst passing up through the burning mass of incandescent fuel, into carbonic oxide, which, mingling with the fresh streams of

atmospheric air admitted above the fuel, burns with intense heat, and possesses great evaporative power. The circulation of the water in the boiler is forced by mechanical means, in order that the heat may be rapidly absorbed by a smaller than the usual proportionate area of evaporating surface. Throttle valves are interposed in the air pipes, whereby the supply of air beneath and over the fuel is regulated. In some cases pendent tubes, depending from the top of the fuel chamber, are employed; these contain smaller tubes, down which the water is forced by suitable apparatus. Another arrangement consists of a multitubular cluster of tubes vertically disposed in the boiler flue, and connecting the lower with the upper water space; through these tubes the water is forced from the lower to the upper section of the boiler, the heating products of combustion coursing amongst the tubes through the interspaces; according to other plans the hot draught is sent through groups of tubes horizontally or diagonally disposed through the water spaces.

[Printed, 8*d*. Drawings.]

A.D. 1864, July 5.—N° 1664.

MESSER, Henry.—This invention, relating to "caloric or heated "air engines," is supplementary to a prior invention by this patentee, which he communicated to Walter Davis Richards, who obtained the grant of Letters Patent which bear date November 11, 1863, No. 2806. The present invention consists, 1, of additional details of construction, and the so arranging such engines that the lower part of the cylinder, the air pump, and the furnace are mounted on one horizontal plane which reduces the height, and affords facilities for disposing the fuel feed box over the fire-box, so that when the communication is opened, the fuel will deposit itself upon the fire. 2. Consists in passing the air in its course from the air pump to the furnace, through an annular passage formed around that portion of the length of the working cylinder contiguous to where the packing portion of the piston works within; this arrangement is to prevent the over-heating of that part of the cylinder, while the caloric carried off by the air current is conveyed to the furnace and saved. 3. Consists in partially filling the intervening space between the furnace bottom and the bed plate with water, wherefrom steam is generated by the heat of the surrounding surfaces; this steam may be either used to assist combustion in the furnace or as a source of power. The bottom

of the cylinder may be in contact with the water and kept cool thereby. 4. Relates to the construction of the furnaces and grates of heated air engines, and to various modes of passing and distributing the air therein which is supplied from the air pump. 5. Relates to the construction of the air pump, air passages and valves; the latter open upwards, and close by their own gravity without springs or weights, thus rendering them less difficult of operation. 6. Relates to the piston packings, springs being interposed between the cup leather and the piston head, so as to press divergently on the cup packings. 7. Relates to the construction of the furnaces, and to the use therein of hydro-carbonaceous fuel, such as petroleum or other inflammable fluid of like character, either alone or in combination with solid incandescent fuel; also, to the mode of injecting the fluid by a force pump, in quantities regulated by the governor of the engine.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 5.—N° 1666.

BLAKE, David.—(*A communication from Lysander Button and Robert Blake.*)—This invention, relating to steam fire engines, consists in combining a steam cylinder containing two pistons, to act conjointly with a water cylinder containing two pistons. The cylinders in relation to each other are rectilineally disposed in a horizontal position upon the framework. The pistons respectively in the contiguous ends of the two cylinders are mounted upon a tubular piston rod, and the other pistons in the outer ends are mounted upon a solid rod, which works through the tubular piston rod and out at the farthest end of the steam cylinder, where it is jointed to a connecting rod, which is coupled to a central crank upon a transverse crank shaft, upon which, at each end, is a balance or fly wheel. The bosses of these fly wheels are fitted externally with crank pins, whereto are coupled the ends respectively of the two main connecting rods, which are actuated by a cross head mounted upon the tubular piston rod between the two cylinders. When into the steam cylinder steam is admitted between the pistons, the latter are forced divergently towards the cylinder ends, which movements have the effect, through the connecting piston rods, of causing the two pistons in the pump cylinder, to approach and meet each other in the centre of the cylinder, and when they separate to perform the outward stroke, it is caused by the convergent action of the steam pistons. The

steam slide valve rod is connected to an arm on a rocking shaft actuated by an eccentric on the crank shaft; the ports and induction and exhaust passages are so arranged, that one valve is made to operate the steam for the two pistons, which are kept in position by the two piston rods being respectively coupled, the one to the central crank, and the other or hollow rod by means of the outside connecting rods to the crank pins on the wheels. "By "this description of pump, and its combination with the engine "acting as described, a continuous discharge of water is obtained, "and great force and power is given to the water ejected, and "great regularity and uniformity in the working, and freedom "from shaking is obtained."

[Printed, 8*d*. Drawing.]

A.D. 1864, July 5.—N° 1672.

WILSON, James Edwards.—(*Provisional protection only.*)— "This invention has for its object improvements in locomotive "engines. For this purpose the two steam cylinders are fixed "end to end under the boiler in the central longitudinal line of "the locomotive, which has six wheels, and the axle of each of the "two end wheels has a slight locking motion, in order that it "may accommodate itself to the curves on the railway. Each of "the end axles has also a rectangular frame, to which the oil or "grease boxes and springs are applied. The ends of the framing "of the locomotive rest by two transverse bearers or bars on the "ends of this rectangular frame, and the end framings of the "locomotive are prevented rising from the rectangular end "frames, and also from moving too far horizontally by suitable "clips or stops. It is preferred that the two steam engines "should give motion to all three axles, and with this object the "piston rod of each cylinder is connected by a forked connecting "rod to crank pins on the wheels; on one of the end axles the "forked connecting rod is connected to the piston rod by hori-"zontal and vertical pin joints."

"In order to give motion from the piston rods to the central "axle and the wheels thereon, each piston rod carries a cross "head, to which connecting rods are attached at one of their "ends, the other ends being connected with crank pins carried "by the two wheels on the central axle."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 8.—N° 1693.

CARBUTT, Edward Hamer, and CUTTS, William.—This is an invention relating to the construction and arrangement of the framing of steam hammers, consisting,—

1st. In constructing the hammer framing in one entire piece, and in making a circular or other shaped tup or hammer head, to work up and down in a cylindrical or other shaped chamber forming part of the framing.

2nd. Constructing the framing or standards of steam hammers to form a diagonal metal structure, which may be made of three or more pillars, or the framing may be very materially modified, and still retain up to the cylinder or the plate upon which the cylinder rests, the essential features and strength of a diagonally supporting structure.

3rd. In the use of a variable floor line and of bottom pallets of unusual thickness, whereby the full length of the stroke can be obtained for small or large objects, whereas at present, when a large object is placed under the hammer, a considerable portion of the stroke is lost, or unavailable when most required.

4th. The application of a stage for the attendant, placed between two supports and constructed with metal and glass framing, so that whilst he has a full view of the work upon the anvil, he is at the same time protected from the heat.

[Printed, 2*s*. Drawings.]

A.D. 1864, July 8.—N° 1699.

HASELTINE, George.—(*A communication from Henry Denison Dunbar, John Wesley Labaree, and Hamilton Elà Towle.*)—This invention, relating to "piston heads and their packing," consists in combining with a central uncut piston head ring two pairs of cut rings, disposed, one pair on each side of the uncut ring respectively between the top and bottom flanges or covers of the piston. One flange is cast with the piston head, which is made cruciform, with a central boss to receive the piston rod, the ends of the lateral radial projections of the head being turned to fit to the internal diameter of the piston head ring, which is slid on and rests against the bottom flange or cover. A portion of the top and a corresponding portion of the bottom of this ring is removed so as to form, in conjunction with the bottom flange and the top cover, two angular recesses to receive the two pairs of cut packing

rings; these rings are arranged to break joint, the inner ring of each pair fitting into an angular recess formed inside the outer ring. The packing rings are caused to expand by the reaction of springs combined with the expansive pressure of the steam, which gains admittance by turns to the back of each pair of packing rings, through holes respectively in the bottom flange and the top cover, which is fixed in its place by screws or bolts. Segmental packings are also used in combination with the uncut piston head ring and the two pairs of cut packing rings, and divergently acted upon by springs and the pressure of the steam.

[Printed, 8*d*. Drawing.]

A.D. 1864, July 8.—N° 1701.

ROGERS, ABRAHAM.—The object of this invention, which relates to supplying fuel or heat to steam boiler and other furnaces, and is also applicable to the ventilation of mines and places, consists in utilizing the heat generated in coke ovens. For this purpose the coke oven is placed contiguous to the boiler, with flues so arranged that the heat evolved by the coking fuel passes into the boiler furnace, where the coke is afterwards consumed; the object being to generate steam by means of the heated products of the combustion of small coal during the coking process, and maintain the fire in the boiler furnace by means of the coke produced.

To effect the ventilation of mines, and dispense with the constant attention required by ordinary fires, one or more coke ovens are constructed near the top of the shaft which emits the foul air from the workings beneath, a flue communication being made between each oven and the mouth of the shaft, which is otherwise closed; other flues receive the flames and heated gases combined with the vitiated air from the mine, which is caused to pass through the ovens over the surface of the burning fuel, thereby inducing an upward current or draught from the mine, which receives supplies of fresh air down the working shaft. Instead of erecting the ovens on the surface, they may be placed at the bottom of the shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 9.—N° 1708.

HARTSHORNE, GEORGE.—(*A communication from Thomas Holt.*)—(*Provisional protection only.*)—This invention, relating

to packing for engines and machines, "consists in packing the
" cylinders and pistons or other similar working parts of such
" engines or machines as may require air-tight packing, by the
" employment of a jacket of mercury for such parts to work in;
" for instance, in constructing a steam engine, an outside cylin-
" der. . . . . of cast iron is employed having projecting flanges
" for the support of the guide frames. Inside this a second
" cylinder . . . . . is placed, formed of boiler plate with a cast-iron
" top rivetted to it; between these two cylinders is a jacket
" space . . . . . filled with mercury, in which works the moving
" cylinder, the mercury keeping the cylinders constantly packed
" steam-tight."

[Printed, 6*d*. Drawing.]

A.D. 1864, July 13.—N° 1749.

WEILD, WILLIAM.—(*Partly a communication from Philip Justice.*)—(*Provisional protection only.*)—This invention relates to the construction of such pressure gauges as act, by the pressure to be measured, on a piston of small area, the motion of which is transmitted to a larger piston (or vice versa). A pipe, bent downwards so as to contain the water of condensed steam, is interposed between the steam and the gauge, so that the hot steam cannot come in contact with a diaphragm of vulcanized india-rubber secured upon an annular seating in the lower part of the gauge, by a hollow screw plug. A piston rests upon the upper side of the diaphragm, and is connected with another piston which presses against another diaphragm, the margin of which is pressed down and secured to its annular seating by the marginal edge of a circular disc plate, so as to prevent the escape of mercury contained in a cavity between the disc and the diaphragm; a metal case containing a glass tube is mounted on the disc. When the steam acts upon the diaphragms, by means of the water and the intervening piston, the mercury is pressed against the circular disc plate and forced up the glass tube, indicating by its height on a graduated scale marked upon the case, the degrees of steam pressure. To check oscillations in the column of mercury, a valve made of prepared india-rubber or other suitable material is placed in the central hole of the disc wherein the bottom of the tube is inserted. The invention also includes modifications of these gauges, whereby they may be employed for ascertaining maximum pressures as a check upon engineers and stokers, which

is effected by the use of a valve in a two-way common plug tap, so as to permit the ascent, but not the fall of the mercury.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 15.—N° 1770.

SAUNDERS, Jones.—This invention relates to "instruments "for indicating the density of water used in steam boilers." The details of construction are modified and admit of various arrangements. One form described consists of a main cylindrical vessel or chamber provided internally down one side with an induction tube or passage, and another tube down the other side for the eduction. The upper end of the induction tube is provided with a funnel-shaped piece, and the lower end reaches near to the bottom of the vessel. The top of the eduction tube terminates within the vessel, at the point where it is desired to make the overflow; the lower end of this tube opens out at bottom through the central neck or stem. The vessel, which contains both the hydrometer and thermometer, has about its mid height an elliptic opening in front, into which is securely fixed or set water-tight, a frame of corresponding shape, containing glass or other transparent material, capable of enduring heat, through which the indications of the hydrometer and thermometer may be read. A top cover encloses the vessel and tubes; the pointed nozzle of a stop cock which is mounted on the centre of the cover, descends into the vessel and terminates a short distance within the funnel piece. A tube connected to the boiler leads to the stop cock. The water enters from the boiler through the stop cock, passing down through the nozzle into the funnel, where it separates from the steam which passes away with the outflow, so that no ebullition takes place within the instrument.

[Printed, 8*d*. Drawing.]

A.D. 1864, July 15.—N° 1776.

GILL, John.—This invention relates to the means employed for arresting the momentum and reversing the motion of heavy reciprocating parts of machinery, so as to convert the momentum into an available force for assisting at the beginning of the return movement. The most convenient means employed for the purpose, consists of a cylinder and piston, either of which may be stationary; valves are fitted to the end of the cylinder to admit

air if required when first starting a machine into motion, assuming that the piston moves with it. The cylinder is so attached in any convenient way to the movable part of the machine or engine that when about or a short distance beyond the centre of vibration of such moving part, the piston rod shall come in contact with a fixed body or stop, so as to force the piston towards the other end of the cylinder; by this means the air therein, having no vent, is gradually compressed, until at the end of the vibratory movement, and when the return is about to commence, a considerable amount of reactive force has been accumulated in the cylinder, due in a great measure to the checking of the momentum of the moving body; when the return movement begins, this force acts conjointly with the motive power but with gradually diminishing impulse up to the centre of vibration, when another cylinder and piston rod, mounted to act on the reverse or opposite end, in like manner receives and counteracts the effect of the momentum, and gives it back as the reactive force of compressed air to assist in raising the momentum of the return stroke; it is in fact an air buffer. Arrangements are made whereby one cylinder and piston are made to act for both movements. The invention amongst its numerous uses may be applied to the beam or cross head of a steam engine, the travelling type table of a printing machine, and to a saw frame.

[Printed, 8*d*. Drawing.]

A.D. 1864, July 16.—N° 1786.

CLAYTON, John.—This invention relates to furnaces for heating and melting iron and steel, which may be worked in combination with one or more steam boilers, for generating steam by means of the waste heat from the furnaces.

Furnaces for heating ingots of iron or steel are described as follows:—" I place the fire-grate or fire-bars of the furnace at the " back or the side of the furnace opposite to that at which the " opening for charging the ingots into and removing them from " the furnace is situated. The fire of the furnace, after passing " the furnace bridge, travels along the arch and over the furnace " bed to the opening at which the ingots are introduced, and de- " scending, passes back through a flue under the bed of the " furnace to the stack or chimney, or the fire may pass back to " the chimney or stack over the arch of the furnace instead of " under the furnace. The openings at which the ingots are

"introduced and removed are provided with sliding doors or "counterbalanced or other doors. The furnace is fed with fuel "through fire-doors at the side or back of the furnace. By "arranging the parts of the furnace in the manner described, the "ingots when placed on the bed of the furnace have their "greatest length in the direction in which the fire is travelling; "the fire consequently passes over and between them, and heats "them with greater uniformity than when it passes over them "transversely as it does in furnaces of the ordinary construction. "Two or more of the furnaces may be conveniently built side by "side, and open into a common chimney. The waste heat of the "furnace may be used for heating either a horizontal or vertical "steam boiler."

Modified arrangements of double and single furnaces for heating or annealing articles of iron or steel after they have been rolled or fashioned, and reverberatory furnaces for melting iron or steel are illustrated and described. These furnaces are combined with vertical or horizontal steam boilers, and jets of steam applied under the grate-bars are sometimes employed to assist combustion when the fuel is of inferior quality.

[Printed, 3*s*. 10*d*. Drawings.]

A.D. 1864, July 18.—N° 1797.

WESTMACOTT, PERCY GRAHAM BUCHANAN.—This invention relates to machinery combined with steam or other motive-power apparatus, for dressing stone, and cutting or driving galleries or tunnels through stone and other mineral. The cutters and tools are not affixed to the hammer head; they are held in position by the mechanism to receive the blow, and when the hammer recedes are shifted and reset to receive the next blow, and so on, being kept steadily in contact with the surface of the material acted upon. In stone dressing machines, one or more cutters or tools may be used. The stone is stationary, and the machinery is made to move on suitable rails or guides. The cutters are moved and reset in position by self-acting gear.

The main framing of machines designed for cutting tunnels or galleries, or otherwise operating on, or working through stone or minerals, is carried upon wheels or sledges, in order to afford facilities for withdrawing from, or advancing the machine to the work; a table, guides, screws, and other adjustments are provided, so that the tool may be angled to operate in the direction

required. The machine may be rigidly fixed into working position by means of the pressure of hydraulic or other rams, which are arranged to abut against the roof or sides of the tunnel; various devices may be resorted to for raising, lowering, and angling the tool holder frame, which carries the driving engine, the operating machinery, and the tools.

In some cases the hammer is actuated by a spring, and in other mechanical arrangements by the action of steam, water, or compressed air.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1864, July 18.—N° 1798.

COSSERAT, François Constant.—This invention, relating to the combustion of smoke, is applicable to steam boilers and puddling and other furnaces. It consists,—

1st. "In the shape and arrangement of the bars of the fire-"grate, which are inclined, undulated, and with slanting upper "surfaces for the purpose of causing the coal to arrive by degrees "and successively to heating, burning, and incandescence, by "facilitating the ingress of air."

2nd. "In the particular disposition of the coal-loading aper-"ture where it is heaped up and supported by a cast-iron plate "with a second aperture beneath intended for introducing a "poker, with which the fireman pushes the coal forward to cause "it to fall to the ignited point, where by its disintegration the "burning gases are left free."

3rd. "In the particular arrangement of the air pipes; the inlet "aperture of the one being above the portion of the grate where "the ignition begins, and where the gases evolving abundantly, "and carrying along with them a great many fuliginous particles, "can be ignited, but by their mixing with the air which egresses "through numerous perforations producing the effect of a blow-"ing apparatus or blast, the inlet apertures of the second air "pipe being situated below and on each side of the ash-pit; the "air supplied by this latter pipe arrives in a thin sheet in the "whole breadth of the fire chamber beneath the altar-piece it is "darted or projected on to the burning coal, and mixes itself "with the blaze as the latter is carrying away more or less "gas and smoke, the burning-off of which is thus completely "achieved."

[Printed, 10*d*. Drawing.]

A.D. 1864, July 23.—N° 1834.

STEVENSON, Graham.—This invention relates to various modifications of valves suitable for apparatus worked by steam or other fluid.

"One of the simplest modifications is suitable for a steam "hammer having a moving cylinder and a tubular piston rod, "by which tubular rod the steam enters and leaves the cylinder. "The top of the rod communicates with the exhaust pipe, and "when applying the improved valve a diaphragm is formed "across the inside of the rod a little below its top, whilst two "sets of openings are formed in the side, one set below and the "other set above the diaphragm. The valve is cylindrical in "form and encircles the rod at the part with the openings fitting "the rod closely at its top and bottom edges, but having its "middle part hollowed internally. These parts are enclosed in "a space forming the steam chest, into which the steam is "admitted in the usual way, and when the cylindrical valve is "lifted so as to uncover the lower openings, the steam enters by "them into the rod and thence into the cylinder, but when the "valve is lowered its hollow part puts the two sets of openings "in communication, and the steam passes into the upper part, "and thence away by the exhaust pipe. The steam pressure "being on all sides of the valve it is always in equilibrio, and it "works with the least friction. The valve is by preference cut "through at one side, where it is formed with flanges which "are united by screw bolts, so that by drawing the flanges "together, more or less, its fit upon the rod may be adjusted "with the greatest nicety." There are various ways of operating the valve, which may be made in halves or only cut through on one side, so that by means of screws, it can be tightened upon the rod. As arranged for a steam engine, two of the cylindrical valves are used, and work on two pipes lineally fitted at each end respectively of a central exhaust chamber; the outer ends of these pipes communicate with the cylinder ends.

[Printed, 10*d*. Drawings.]

A.D. 1864, July 25.—N° 1847.

JOHNSON, John Henry.—(*A communication from Felix Ménard.*)—This invention, relating to safety valves suitable for

either locomotive, stationary or marine boilers and steam generators, compressed air or gas containers, consists in combining a small supplementary valve with one of the regulated size. The main valve is enclosed in a chamber mounted on the boiler, and is in no way connected with levers weights or springs for holding down, these are all dispensed with. The valve seat may consist of two concentric annular bearing surfaces, between which are formed the steam escape apertures, which lead downward and open to the atmosphere below. A passage above the valve leads from the upper part of the valve chamber into a side chamber, wherein vertically works the small supplementary valve spindle which, excepting at its upper end which fits accurately through a metal gland in the top of the chamber, is longitudinally grooved. The lower end of the spindle projects through a bottom gland or guide into the boiler and carries the valve, which closes upward against the end of the guide; the upper part of the spindle passes out through the top gland and carries a closed cup to contain the necessary quantity of mercury or other suitable material for weighting the spindle, and prevent the rising and closing of the valve, which in the normal state remains open and admits steam to the valve chamber above the main valve, whereby the latter is placed in equilibrio. Whenever the pressure of the steam becomes unduly raised, then the resistance of the weight upon the small valve spindle is overcome, the spindle is raised and the valve brought up to its seating and closed, the steam contained in the chamber escapes through the upper gland, and the main valve no longer pressed down thereby, opens to relieve the boiler.

[Printed, 8*d*. Drawing.]

A.D. 1864, July 25.—N° 1850.

RAVARD, Jean Pierre.—(*A communication from Louis Brunier.*)—The object of this invention is to obtain motive power by means of passing a current of high-pressure steam through a series of cylindrical chambers. The steam enters through a pipe and suitable valve at the extreme end of the series and courses through each chamber in succession to the last. Each chamber contains a closed cylinder of such diameter as to leave only a narrow space around. The steam in passing out of the first chamber rushes through the narrow space or orifice, following the surface of a cone fixed on the end. The apex of this cone enters

the connection with the next chamber, whereinto through a tapering tube the steam rushes, its molecules acquiring a centrifugal force, which adds to their speed, and when issuing from the mouth of the tube and striking the end of the second cylinder and pressing on it with an unbalanced pressure, the first onward impulse is given to the machine; the second chamber and all the others in the series are furnished in the same manner with a closed cylinder and cone and orifice in all respects the same as the first. The next impulse is given by the rush of steam into the third chamber, and so on, the effect being continuous, until having passed the last chamber, the steam passes off through a waste pipe. The series of chambers is enclosed in a metal casing, clothed with felt or other non-conductor of heat. The apparatus may be employed for propelling vessels, which if not of sufficient length to contain a series of the required power, two or more shorter series acting conjointly in the same direction may be employed. For a stationary engine the chambers may be circumposed in a frame revolving on wheels round a fixed central axis, the wheels to run on concentric rails and support the weight of the apparatus.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, July 26.—N° 1857.

BONNEVILLE, Henri Adrien. — (*A communication from Gilles Deprez.*)—This invention relates to feed apparatus for steam and other boilers, and to raising and forcing fluids. It comprises a pump chamber either vertically or horizontally placed, which chamber resembles an engine cylinder and contains a solid piston with metallic packing. It is furnished with two distributing conduits, exclusively used for the outlet of the water which enters through a conduit between the two. "The three "conduits open into a table or plate well adjusted and cast with "the cylinder, in which are formed three rectangular openings "or ports," which are covered exactly by a brass box, which has a circular opening above closed by a cock. A brass slide valve works upon the table with to and fro motion, coming alternately into communication with the central port and one or other of the side ports. The piston rod and slide valve rod are timed to act in concert. Two small pistons, serving the purpose of a slide valve, may be used instead. The conduit cast with the cylinder receives an aspirating tube which communicates with the well or

water tank and has the form of a syphon "so that the cold water "rising in it to a certain height, the distance to which the water "is to be raised is diminished, and it thus becomes easy to set "the pump to work." Arrangements in connection with the pump for feeding boilers, consist in placing a closed vessel, provided with safety and atmospheric valves, in such a position within the flues, that the hot draughts may heat the water which has been forced into it by a pump; when heated to a boiling state, the aspirating tube is closed, and the boiling water is drawn from the vessel and forced into the boiler by the pump, which is constructed to operate upon hot water with the same facility as it will upon water in a cold state.

[Printed, 10*d*. Drawings.]

A.D. 1864, July 26.—N° 1863.

FURNESS, GEORGE, and SLATER, JAMES.—This is an invention of steam machinery for dredging and excavating large caissons, cofferdams, docks, and other works; it is also intended to act as a filth hoist. The apparatus consists of a substantial wood frame or platform, mounted on flanged wheels for travelling on rails. Suitably disposed upon the frame, there is a vertical steam boiler, and an engine cylinder fixed at the requisite angle for giving motion to a transverse shaft, and through it to two other shafts, which are connected therewith by appropriate gearing. The upper shaft carries a pentagonal drum, so formed for the purpose of receiving and actuating the circuit of an endless chain of buckets. Depending from the frame or platform there is a hollow bucket-ladder or jib, which for the purpose of extending or shortening its length, to suit different operations and depths, is constructed on the telescopic slide principle, one section of its length being made to slide into another by means of a screw connected by bevel wheels to a spindle and handle operated by hand. The lower end of the jib carries bearings for the axis of a square drum, which receives the chain and descending buckets and turns them in the upward direction; the buckets during the time they are passing under the axis of the square drum, scrape and gather into themselves in succession portions of the material from the bottom of the excavation. The buckets thus loaded are carried upwards by the endless chain, and at the highest point, having turned over the pentagonal drum, their contents are discharged into a shoot, which delivers the material into trucks or carts for

removal. The bucket-ladder or jib may be disposed for work either vertically or in an oblique position resting against its work, and the machinery and motive power may be fitted on board a barge or vessel suitable for dredging purposes.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 26.—N° 1864.

IRWIN, William.—This invention, relating to a compound for preventing incrustation in steam boilers, consists in mixing with the water in the boiler, the following ingredients, which are by preference compounded and used in the following proportionate quantities. Of French ocre $\frac{3}{4}$ of a pound, Oxford ochre $\frac{3}{4}$ of a pound, brown ochre $\frac{3}{4}$ of a pound, yellow ochre $\frac{3}{4}$ of a pound, Vandyke brown $\frac{1}{2}$ pound, Spanish brown $\frac{1}{2}$ pound, purple brown $\frac{1}{2}$ pound, ground umber $\frac{3}{4}$ of a pound, and ground ochre $\frac{3}{4}$ of a pound. The quantities given of the above ingredients, mixed together in a gallon of water and put into a boiler 17 feet long by 5 feet diameter, will prevent any incrustation.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 29.—N° 1885.

SANDERS, Richard David.—(*Provisional protection only.*)—This invention, relating to slide valves "consists in a method of in-" serting metallic or other packing pieces steam-tight into recesses " formed upon the inner surface of the steam chest cover, or upon " a plate introduced into the steam chest, or upon the back of " the valve or plate attached to it, for the purpose of counter-" balancing the pressure of the steam upon the back of the valve. " The steam chest cover or plate has a communication through " it with the atmosphere or not, as considered advisable. Two " pieces of metallic or other packing, rectangular or otherwise, " each having one of their surfaces convex, are inserted into the " recesses or flanges with their convex surfaces face to face, and " between them is inserted india-rubber or other suitable packing. " A small quantity of steam is admitted through ports upon the " back of these packing pieces, pressing them together and " against the steam chest cover or back of the valve, as the case " may be, and from the convexity of their inner surfaces the " packing inserted between them is pressed out from either side " against the projections or flanges forming the recess, thereby

" preventing the steam entering upon the back of the valve or
" through the communication to the atmosphere. The inner
" projection or flange is cast upon the inner surface of the steam
" chest cover or plate attached thereto, and the outer one cast
" whole and screwed on. In locomotives where there is so little
" space the packing pieces are fitted round the outside of the
" valve, which then forms as it were the inner flange of the recess
" the outer flange being cast whole and screwed upon the part of
" the valve working upon the valve face. As in the former case
" the packing pieces are pressed out by the pressure of the steam
" against a hollow plate inserted into the steam chest having a
" communication with the atmosphere."

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 1.—N° 1912.

ATTWOOD, Henry.—This invention, relating to the packing and lubricating of the piston and other rods, and such other moving parts of steam engines and machinery as have to work fluid-tight through stuffing boxes, consists in the use of hollow rings made of soft metal, which rings in cross section are either circular or elliptical; they are introduced one above another into the stuffing box, until it is full, fitting easily into the annular chamber beneath the gland, which when screwed down, by compressing the rings causes them to expand laterally and so make both externally and internally a tight joint. A soft metal tube, coiled spirally round the piston rod and pressed into the stuffing box, may be used, but it is believed not with the same advantage. In some cases solid rings of soft metal are used, with rings of hard metal alternately interposed; the soft rings are V-grooved top and bottom and the hard rings in cross section are lozenge shaped, so that when pressed together the latter enter the grooves of the soft rings, and thereby cause an internal and external spreading of the soft metal against the walls of the box. For lubricating purposes, a small reservoir surrounded with a steam jacket is employed to contain tallow, which is kept in a melted state; by means of a small cylinder and piston placed within the reservoir, the tallow is forced through tubes in regulated quantities in the direction of those frictional parts of engines and machines which require lubricating. The apparatus is also used for injecting the lubricant into the steam pipe of an engine, so

that the current of steam may carry it into the valve box and there lubricate the valve surface.

[Printed, 10*d*. Drawing.]

A.D. 1864, August 8.—N° 1968.

RUNKEL, MARK.—(*Provisional protection only.*)—This invention, relating to an automatical regulator for marine steam engines, consists of a pendulous rod furnished at its lower end with an adjustable weight, and so arranged that its action on the throttle valve is only effected by the rolling or pitching of the vessel. In calm weather with a smooth sea it is entirely inactive, and in a rough sea it will only reduce the steam when, as the vessel rolls or pitches, a portion of the wheel or screw is raised above the surface; it will then cut off such proportionate quantity of the steam as the diminished resistance requires and thereby maintain the engine at its normal speed and prevent racing of the screw. The pendulous rod is suspended either in a universal joint or a gimbal and always hangs in a perpendicular position irrespective of the motions of the ship. A segment, the centre of which is within the ball of the universal joint, and an excentric are attached to the top of the pendulous rod, and are so connected to the lever of the throttle valve, that no effect is produced on the valve while the segment is in contact with the lever, but when, in consequence of a change in the position of the vessel, the lever is brought on the eccentric, it is gradually raised or lowered, and then acts upon the valve.

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 8.—N° 1972.

LESSWARE, JOHN.—(*Provisional protection only.*)—This invention relates to ball valves for drawing off condensed water. Instead of as heretofore, attaching the float ball to the end of the valve lever, either within the vessel occupied by the steam and where the condensation deposits, or in a chamber communicating therewith, the valve is mounted on a hinge joint near the opening, and the ball is mounted direct upon the valve, so as to occupy as little space as possible; both ball and valve may be enclosed in a case a little larger than the ball. For example, if the ball be 2½ or 3 inches in diameter, the spherical chamber to contain and allow it liberty to act, should be about 4 inches in diameter inter-

nally, with sufficient opening at top for communicating with the water or steam in the vessel and with an outlet passage for the water underneath. The ball is fixed to the valve by means of a short tubular stem, which passes through from the underside of the valve; any water which gets into the ball escapes down the tubular stem.

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 9.—Nº 1978.

PAYNE, MARK.—This invention relates to details in the construction of traction engines, with a view to maintain their working efficiency. The power is transmitted to the traction wheels through an open gear or skeleton wheel, composed of two rings which form the sides of the rim; these rings are carried by forked radiating arms and are bolted or rivetted together by a circumposed series of intermediate bars, the ends of which are respectively set at regular intervals into the contiguous faces of the rims, leaving a space between each bar equal to its breadth. These bars form the teeth of the wheel, which is actuated by a toothed pinion attached to a chain wheel, which obtains motion by means of an endless chain from a chain pinion on the crank shaft. The cross shaft which carries the driving pinion also carries a capstan, to be used when required for hauling, by means of a chain and anchor, the engine out of any slough whereinto it may happen to run; this cross shaft revolves in sliding bearings for the purpose of throwing the pinion out of gear, which is effected by a hand lever and suitable connections under the boiler; the driving pinion may then be put into gear with the hauling tackle and drive the windlass ordinarily used in steam cultivation. The cylinders can be mounted within the smoke box, either above or below the boiler. When the engine is intended for general agricultural purposes, the upper disposition of the boiler is preferred, but if intended exclusively for tractive purposes, such as steam ploughing or drawing loads, it is better placed below, as one shaft and the endless chain and chain wheels are dispensed with. The head of the piston rod slides on a single guide, attached at one end to a flange cast to the stuffing box and at the other extremity to a bracket fixed to the boiler. The head is made in two parts, to allow of easy access to the coupling brasses.

[Printed, 10*d*. Drawing.]

A.D. 1864, August 10.—N° 1986.

DAVIES, George.—(*A communication from Hippolyte Jean Adrien Holagray.*)—(*Provisional protection only.*)—This invention relating to steam boilers or generators, consists (it is stated) of a system of construction applicable to steam generators of any form or material, whether horizontal or vertical, or whatever be the purpose for which they are employed or the nature of the fuel consumed; and amongst other advantages, they possess the property of consuming smoke. The generator comprises a central boiler surrounded by and in communication with one or more annular water spaces, concentric or otherwise, contained within a surrounding shell which constitutes the main body of the boiler. The flaming current and heated gases pass either lineally between the annular water spaces, or are made to take a winding course, by means of spiral partitions suitably placed in the annular flues. "When circumstances require it the central boiler may be dis-"pensed with, and there will then only remain a series of annular "water spaces, between which the flame and heated gases pass "through flues or passages of a helical form."

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 13.—N° 2025.

PILLINER, Alfred Colerick, and HILL, James Charles.—This an invention of apparatus for obtaining motive power, and measuring, raising and forcing fluids. It consists of "two or it "may be more toothed wheels, or two rolling curves; one of "the wheels or curves is fixed on the main or driving shaft, and "is called the 'driver,' and the other or others are geared into it, "and called the follower. We enclose these in a chest or case "properly bored out, so that by suitable packings on the apexes "and sides of the teeth the wheels revolve steam or fluid tight in "the said chest or case. Steam or fluid under pressure is admit-"ted into the case through an opening at its side opposite to "where the two wheels or curves gear or roll together, and on the "opposite side of the case an opening is made through which the "steam or fluid may pass away."

The motive power is to be given off the axle of the "driver" wheel by means of a pulley, and by causing the steam to enter through the exhaust port the motion of the apparatus may be reversed. When used for forcing, measuring, or raising fluids,

power from another engine must be applied to the pulley on the driving shaft.

[Printed, 1*s*. 4*d*. Drawing.]

A.D. 1864, August 24.—N° 2088.

COCHRANE, Arthur Auckland Leopold Pedro.—This invention, "for heating and evaporating liquids and fluids," relates to marine and other steam boilers, and to vessels for evaporating purposes, and consists,—

1st. In the application of a depending or inverted bridge to the extreme end of a furnace, either in front of or beyond the ordinary bridge, for the purpose of causing a detention of the heated and flaming products of combustion in the crown of the furnace.

2nd. Relates to arranging the vertical water tubes which are employed to connect the upper and lower water space in the fire and flue chambers of steam boilers, wider apart at the entrance of the flue or chamber, and more closely packed together at the back, in order that the fire draughts may penetrate and course easily through the interspaces, without encountering any sudden check.

3rd. Fixes circulating plates in the water spaces contiguous to the heating surfaces of steam boilers, in order to induce free circulation of the water in the interspace.

4th. Applies pendent water tubes closed at their lower ends, in boiler furnaces in combination with a depending or inverted bridge, such tubes being furnished with internal tubes to promote and ensure an upward and downward current of water in the pendent tubes.

5th. Places flat or narrow cellular water chambers in furnaces over or contiguous to the fire, such chambers containing space for holding thin sheets of water, which communicates in a circulating flow with the water spaces of the boiler.

6th. Applies a furnace door horizontally divided into two parts, in order that by opening only the lower part, when the fire requires stirring, the cold air may be more or less excluded from the upper part of the furnace.

[Printed, 8*d*. Drawing.]

A.D. 1864, August 31.—N° 2139.

ANDREUX, Jean Baptiste, and COULON, Eugène.—This invention, relating to "the application of a combination of steam

"and air as a motive power to ships and vessels of all descrip-"tions," consists in generating steam in a boiler of suitable shape and size, wherein is spirally coiled a superheating copper tube, through which the steam passes by means of a small nozzle or jet direct into a second tube, the entrance to which is slightly bell-mouthed, so that a thin annular air passage is formed between the contiguous ends of the two tubes; during the rush of the steam from one tube into the other, the air is drawn in through the thin air passage and mingles with the steam in the second tube, which is connected to pipes extending through the stern of the vessel and opening outside below the water line; branch pipes may lead from the second tube through the sides of the vessel, and be suitably curved outside towards the stern. The constant combined stream of superheated steam and air issues from the open end and branches of the second tube so as to strike against the water in the direction of the helm, and (it is stated) "aid in propelling the ship."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 1.—N° 2149. (* *)

BENNISON, Henry.—(*Partly a communication from Frederick Arundel Downing.*)—"Improvements in rotary steam and water-"power engines."

"This improved apparatus consists of a wheel or disc rotating "concentrically within a fixed case of larger diameter, thereby "providing an annular space constituting the pressure and piston "chamber. . . . The pistons or pallets are projected from and "withdrawn within the rotating wheel at certain points of the "circumference, in order to receive the pressure of the fluid and "to pass an abutment offering the resistance to the fluid neces-"sary to oppose and cause its force to be exerted upon them. "The pistons are supported and carried by stems supported in a "radial position on the rotating wheel, such stems being fitted "in suitable guides to permit of the motion towards and from the "axis of the wheel, and are actuated by suitable fixed cams or "inclines, the one near the centre acting on the stems to protect "the pistons, the others at the periphery to thrust them towards "the centre, each at their proper periods in the revolution. The "periphery of the wheel is made of greater or less breadth accord-"ing to the power of the engine required. The pistons or pallets "are of the same breadth as the wheel, and with it fitted steam

"or water-tight, or nearly so, between the sides of the case. The "pallets also fit tight, and are furnished with packings in open-"ings in the periphery through which they are projected, and "are of course of sufficient area to intercept the annular space "before mentioned."

[Printed, 10*d*. Drawing.]

A.D. 1864, September 5.—N° 2170.

LLOYD, Edward Rigge, and LLOYD, Samuel.—(*A communication from John Hervey Knickerbocker.*)—This invention relating to a method of securing tubes in tube sheets "consists in "the employment of a ferrule having a concave outer surface "or periphery of slightly taper form, and of such diameter that "it may be driven into the end of the tube and expand it in such "manner that the end of the tube will close around the hole in "the tube sheet to receive the tube, and thus form a tight and "permanent connection of the tube to the tube sheet, admitting "of the tube being of equal diameter throughout." The hole in the sheet tapers inwards and the edges are rounded; it is somewhat larger in diameter than the tube, the end of which is caused to expand when the ferrule is driven in; a tapering mandrel is then forced by blows or otherwise into the ferrule, which causes its expansion and also a further expansion of the end of the tube, until the exterior of the latter closes round the edge of the hole in the tube sheet, and the inside diameter of the ferrule is brought to correspond in size with the internal diameter of the tube. The ferrules used heretofore, have had the objectionable effect of partially closing the tube ends to the extent of the thickness of the ferrule; according to this present invention, that objection is removed, as when properly fitted the inside of the ferrule is left flush with the inside of the tube.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 5.—N° 2171.

LLOYD, Edward Rigge, and LLOYD, Samuel.—(*A communication from Renel Blackwood.*)—This invention relates to the application of hydraulic pressure for causing the lateral expansion of the ferrules used on the ends of boiler tubes when fixing them in the tube sheets. For this purpose a small portable hydraulic hand press is employed, an adjustable hollow conical frustum, and an adjustable clamp, one end of which abuts against the end

of the press cylinder, and the other (which is capable of slight expansion) against the outer end of the ferrules; the stem of the main piston projects through the end of the cylinder and is furnished with a cross head at the end. The frustum for a short length is of the same diameter as the inside of the tube and tapers slightly towards the other end; it has a central flat oval hole through it from end to end, made in that form to receive the cross-head on the stem of the press which, when passed through and turned so as to bring the cross head across the hole, prevents its coming out. The holes in the tube sheet are opened and rounded off on each side. A shallow groove is sunk round the ferrule, which latter also is tapered slightly at the inner end. When about to operate, the large end of the frustum is introduced into the end of the tube, and the ferrule is placed on the small end of the frustum; the cross head of the stem is inserted through the frustum and secured by a quarter turn, and the clamp circumvests the stem between the outer end of the ferrule and the press cylinder head. The press when operated by the handle draws the stem into the cylinder, which brings the frustum out of the tube, counter resistance being provided by the clamp between the head and the ferrule, which expands as the frustum is drawn through it and beds itself to the hole in the plate with the tube end interposed, which also expands with the ferrule and so makes a tight joint.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 8.—N° 2192.

CROSLAND, JAMES STEAD.—This invention relates to steam engines for blowing, forcing, pumping, driving machinery, and other purposes, to arranging steam hammers and other steam machines in connection with a condenser, and to consolidating the construction of the walls of engine houses and engine beds.

1st. Blast engines for blowing or forcing air.—Dispenses with the working beam hitherto employed in the construction of condensing blast engines, and so combines the steam cylinder, the blast cylinder, and condenser air pump cylinder, that the pistons are (according to one arrangement) all connected to the piston rod, or an elongation of the piston rod of the steam cylinder. Another modification disposes the blowing cylinder above the steam cylinder (their respective pistons being on one rod), and works the condenser air pump by a lever connected to the cross

head. According to another modification, three steam cylinders are bolted together side by side, an elongation of the piston rod of the middle cylinder works a single or double-acting air pump, which is disposed in a vertical line beneath, and the piston rods of the two side cylinders, work the pistons of two blast cylinders, which are respectively disposed beneath the two steam cylinders. The valves of the blast cylinders are worked by excentrics or cranks upon an independent shaft, by means of rods or levers connected to the piston rods.

2nd. Direct-acting condensing pumping engines.—These engines are arranged according to the modifications described for blast engines, excepting that suitable pump barrels and valves are substituted for blast cylinders, and in some cases the air pump is omitted, the pump barrel being made to answer the double purpose of drawing air from the condenser, and pumping water for general purposes.

" Constructing valves for pumps by means of two discs of
" india-rubber, one above the other below a disc weight; one
" disc of india-rubber comes between the weight and grid valve
" facing the other disc of india-rubber between the weight and
" the stop, which limits the height to which the disc can lift, the
" upper disc forming a buffer for the weight, which is guided
" by a pin or other means in its ascent and descent."

3rd. Consists in so arranging high-pressure steam engines, and working-engines, such as steam hammers, blowing engines, and rivetting machines, that the exhaust steam from each engine or machine, shall be conducted into one pipe leading to a condenser, which shall be common to all. A large air pump, worked by a separate engine, to be employed if necessary.

4th. Consists in so bracing engine-house walls and engine beds together by means of an iron frame, which extends partly or wholly round the walls at the level of the entablature beams, that the strains of the engine are distributed, and greater stability obtained.

[Printed 2s. Drawings.]

A.D. 1864, September 9.—N° 2204.

LÖBNITZ, Henry Christian.—This invention relates to compound oscillating steam engines and to the construction of their valve motions; the parts of such engines may be variously arranged. The engine comprises, on one pair of trunnions, two

cylinders of unequal size, either cast or bolted together side by side, each cylinder carrying one trunnion; they oscillate together as one cylinder and their piston rods are coupled direct to the cranks. High-pressure steam enters through the trunnion of the small cylinder and having actuated the piston therein, passes through the eduction passage which leads into and constitutes the induction passage into the large cylinder, where the steam is worked expansively and afterwards exhausted through the trunnion of the latter cylinder into the pipe leading to the condenser. The valve motion can be worked by a wiper shaft; the lever end being brought out by a bend to the centre of the trunnion, is acted upon, either direct or through a link, by an eccentric or other motion from the main shaft, without the use of the quadrant or sweep ordinarily applied to oscillating cylinders. The steam ports in the slide valve are incased in such a manner, that the steam admitted to the cylinder is let in through the back of the valve, whereon the cut-off plate valve is placed. These latter valves may be acted upon by a wiper shaft in the same manner as the main slide valves, or they may be moved by an eccentric or such other convenient motion as may be found suitable. By means of a regulator, adjustable by sliding on the main shaft while the engine is in motion, arrangements may be made for cutting-off the steam at any part of the stroke. These valvular arrangements are applicable to all engines of the oscillating class.

[Printed, 10*d*. Drawing.]

A.D. 1864, September 10.—Nº 2210.

LILLIE, Sir JOHN SCOTT.—(*Provisional protection only.*)—This invention, relating to "apparatus used in propelling by "atmospheric pressure or steam power or both combined" consists, 1, "in propelling vessels or carriages by a partial "exhaustion of the air or one side of a piston or surface, which "piston or surface passes through a partially closed tunnel "having a slot in its side, which slot furnished with valves which "rise and fall, and the vessels or carriages are attached to this "piston or surface by rods, chains, or ropes in any convenient "way, which rod passes out of the slot from the carriage to the "piston by which they may be drawn or propelled." 2, "consists in propelling the carriages themselves in a partially closed "tunnel; the carriages so enclosed may run on rails of wood or "iron or on the plain floor. This tunnel is so arranged as to be

" perfectly lighted by windows whenever desired to be so, so that " the country through which it passes may be seen. In this " tunnel there are also traps for the admission of air, which traps " may be opened and closed by the guard of the train or by " mechanical means." 3, relates to propelling vessels on canals or rivers, along one bank of which a rail is fixed about 18 inches above the surface level of the water. The engine is carried by the " propelling boat." A grooved pulley is mounted on one end of a transverse shaft, which is actuated by an engine on board the boat, and reaches laterally therefrom to the bank, so that the pulley rests upon the rail, and another pulley is arranged to act upwards underneath the rail, so that the latter is gripped between them. When the shaft is revolved by the engine the pulleys move along the rail and so propel or impel the boat. 4, relates to producing the partial vacuum required in the tunnel (mentioned above in the 1st and 2nd part); this is effected by means of a circular fan, with vanes most suitably shaped for the purpose.

[Printed, *4d.* No Drawings.]

A.D. 1864, September 10.—N° 2213.

BRODIE, David. — This invention relates to apparatus for heating water by means of waste steam from high-pressure engines and elsewhere. It consists of a rectangular casing of cast iron or other metal, into which at one side, the steam is admitted through a suitable pipe; at the opposite side a portion of the chamber is partitioned off by a perforated diaphragm, which reaches from the bottom up to a rectangular horizontal tube plate fixed near the top; three edges of this tube plate, which completely separates the space in the upper part of the chamber, are attached to the casing, and the other edge to the top of the diaphragm; the tubes are bent at their mid-length, so as to bring the two ends nearly together and parallel with each other. The tube plate is pierced with two rows of holes, and the ends of the tubes occupy respectively a hole in each row, so that the tubes hanging down reach near to the bottom of the chamber, and in appearance form a series of pendent loops. A low vertical partition is fixed on the upper side of the plate so as to divide the rows of tube holes. The water to be heated is admitted above the tube plate at the same side of the chamber that the steam enters below. The vertical partition confines the water over one

row of holes through which it enters the ends of the tubes, and runs down one side of the series of bends towards the bottom of the chamber and then rises up the other side, passing out through the other row of holes, above the tube plate and on the other side of the partition ; it then falls over the top edge of the diaphragm and down between it and the side of the chamber, its downward course being interrupted at intervals by narrow shelves, projecting from the chamber side, which have the effect of comminuting the water and in succession directing its particles against the diaphragm. The steam fills the body of the chamber between the tubes, imparting its heat to the water coursing through them. The water of condensation falls to the bottom of the chamber; the uncondensed steam passes through the perforations in the diaphragm into contact with the showery current which is falling on the other side, and the heated water is carried off by a pipe attached to the lower part of the chamber, whereon are mounted a vacuum and a pressure valve.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 10.—N° 2219.

MORIARTY, Cornelius. — This invention relates to the construction of wire guards for preventing the flight of sparks from locomotive and other engines. These spark catchers are made of strong wire, which instead of the usual method of interlacing, is worked round a series of frame or stretcher rods in a peculiar manner. The spark catcher described is horizontally disposed between the smoke box and the chimney. It consists of a flat surface of uniformly open wire work, sufficiently apart for the passage of the hot draught and yet so close as to intercept the upward flight of all sparks or particles of incandescent fuel; instead of the covering wire being laced to the frame rods with smaller wire, no lacing is now required; each separate covering wire makes one, two, or three turns, according to its size, round each stretcher rod in succession, in a course from one side or end of the frame to the other; the wires run parallel with each other and the turns or coils round the stretcher rods serve not only as a secure mode of fastening the covering wires to the frame, but also as the intervening packing, whereby a uniform distance is maintained between the wires, which in all spark catchers should be about the same; this, according to the size of the covering wire, is regulated by the number of coils or turns taken round

each frame rod. These spark catchers necessarily vary in size and also in form.

[Printed, 10*d*. Drawing.]

A.D. 1864, September 12.—N° 2225.

KNAB, DAVID CLOVIS. — This invention relates to a mode and apparatus for obtaining motive power by the expansive action of steam, and other elastic fluids, directed against surfaces submersed in a bath of liquid metal. The apparatus consists of a wheel or disc mounted on a horizontal driving shaft and furnished with buckets similar to a water wheel; this wheel is enclosed in a case, the lower half of which closely surrounds the wheel, leaving rather more than sufficient space for the edge of the revolving buckets to clear. The upper part of the case is hermetically closed by a cover; about two-thirds of the circumference of the wheel, inside the case, is surrounded with liquid metal (such for example as D'Arcet's metal) which is an alloy of lead, tin, and bismuth, fusible at a low temperature; the lower half of the case is encompassed by a flue, which is heated by a small furnace underneath and serves to keep the metal in a liquid state. The steam pipe enters at the upper part of the case and passes downwards, within the space between it and the wheel, to beneath the vertical line of the axis, where it terminates with an open end, turned up so as properly to direct the flow of steam into the buckets. The steam is generated in a boiler conveniently near; it acquires an equable temperature with the fused metal while descending through it in the pipe. The force of the steam displaces the metal from within the buckets, as they in succession pass under the centre, and as they rise with the rotation of the wheel, there is the constant pressure of the weight of the metallic medium underneath the steam, tending to raise the buckets, whereby the wheel is kept in motion. Through a pipe which opens out of the cover, the spent steam escapes, as the buckets in succession rise to the surface of the metal. When air is employed instead of steam, it is heated in an apparatus contained in a vertical cylindrical chamber, which combines a furnace for heating the metal and the air, and a motive-power engine. A circular furnace is concentrically fitted within this chamber, so as to leave a surrounding annular space, which is closed at bottom and contains the liquid metal. The cold air is forced by a pump through the furnace in a pipe wherein it becomes heated; this pipe

passes up through the crown of the furnace and discharges the heated air underneath an inverted hollow piston, which works above the furnace in the upper part of the cylinder and dips into the liquid metal contained in the annular space surrounding the furnace. When the up stroke is completed, the air is exhausted by the action of the pump and cooled by suitable means, the piston then descends ready for the next stroke, " and so on alternately."

[Printed, 1*s*. Drawings.]

A.D. 1864, September 13.—N° 2231.

DEAN, John.—(*Provisional protection only.*)—This invention relates to a mode of regulating and controlling the speed of marine steam engines, when by the pitching or rolling of the vessel, the paddle wheels or screw are partially raised above or out of the water, and race for want of resistance. As a remedy for this evil and to ensure steady and uniform working of the engines, the inventor proposes to fix a tube or chamber for each engine, in the case of paddle-wheels, at the side of the vessel, and in screw steamers one for each engine at the stern. In this tubular chamber is placed a hollow spherical floating ball of metal or other material. This ball is attached to a rod or shaft, which moves in vertical guides and, by means of connecting rods and levers, is made to act upon the throttle valve at such times as, when by the rolling or pitching of the vessel, the ball, which floats on the surface, is raised above the water level or line of flotation of the ship. The action on the valve is proportionate to the degree of deviation from the normal level. By the action of this regulator, the quantity of steam supplied is at all times equal to the quantity required in rough weather to overcome the constantly changing amount of resistance. "There being an independent air ball and shaft to each engine and paddle-wheel, the " action is equalized under all circumstances, that is to say, when " the paddle-wheel on one side is immersed and the other out of " water, the valve shall be opened for the greater or lesser passage " of steam accordingly, the entire strain or power being thus " effectually balanced throughout."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 15.—N° 2248.

TOWNSEND, Richard.—This invention relates to a tallow or lubricating cup, for the cylinders and valves of steam engines,

steam hammers, and other purposes. In form the cup is cylindrical, but may be otherwise; it is closed at the ends, which are tapped respectively to receive the screwed end of a stop cock; preparation is made on the outer end of the lower cock for screwing it into a tapped hole, so as to open a communication with the part to be lubricated, and the top end of the upper cock is furnished with a perforated cup into which when charging the apparatus the lubricant is poured, and which, when the cock is open, finds its way down a small passage into the lubricator; another small vent passage through the same cock being simultaneously opened for the expulsion of the air. A small tube fixed to the end of the lower cock projects into the lubricator and terminates above the level of the lubricant. Inside this tube is a rod (with conical ends) which acts as a double piston valve, the upper end serving to close the passage through the upper cock, and the lower end the passage through the lower cock, when either of the opposite passages respectively are open. Two pistons on the rod fit inside the tube; these pistons are grooved to allow the steam to pass up the tube when the lower cock is opened, so that, when the pressure becomes equalized both above and below the lubricant, the latter flows downward by its own gravity.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 15.—N° 2252.

NEWTON, Alfred Vincent.—(*A communication from George Tracy Parry.*)—This invention relates to a mode and apparatus for preventing incrustation in steam boilers. The agent employed is a thermo-electrical current which "entering the shell of the
" boiler finds its way by its own laws of transmission to all the
" tubes, flues, sheets, and to the shell of the boiler, and on
" touching or grasping the handle of the blow-off cock, vibrations
" or tremblings can be felt, somewhat similar to those from the
" poles of a galvanic battery, and these tremblings or vibrations
" being incessant, although strong or weak as the current within
" the boiler may determine, they have the effect of causing the
" old scale to loosen and fall off, while new scale is effectually
" prevented from forming or adhering to the interior of the steam
" boiler." The apparatus consists of a cast-iron box lined with a thick enamel of glass or other non-conductor; fitted vertically through this box is a copper rod the ends of which project above

and below; a fixed collar on the rod fits (with packing interposed) up against the bottom of this box, and a nut and washer on the upper or pointed end of the rod, when screwed down prevents the escape of steam. The box is filled with ground glass so as completely to insulate the rod. On the lower end of the rod which is within the boiler steam space, is screwed a T-joint which receives laterally two hollow brass or copper rods, which project horizontally in opposite directions, each carrying on its extreme end a metallic knob which is furnished with a number of radiating magnetic points. These magnets being negative and powerfully attractive, induce or gather up a strong negative electrical current, which is conducted from an eye fixed to the lower part of the socket, by means of a copper wire, to a pin fixed into the coolest part of the boiler. The current by this reverse plan (it is stated) becomes a positive current of great quantity but more feeble in intensity than a direct shock, which would be too rapid to effect what the more feeble current accomplishes.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 19.—N° 2293.

TAYLORSON, Thomas.—(*Provisional protection only.*)—This invention relates to mechanical apparatus for working coal by steam or other motive-power engine, and consists in causing the apparatus to reverse the valves at any part of the stroke, according to the depth of cut. To effect this an ordinary governor is employed and so connected "with the pick or cutting instrument "that in the forward action or stroke of the pick rotary motion is "given thereby to the governor, causing the balls or vanes to "expand; and immediately on the delivery of the stroke or blow "of the pick the rotation of the governor ceases, when the balls "or vanes collapse and operate a catch lever, which actuates a "suitable arrangement of levers and weight to reverse the valves "for another stroke, and so on, thus economizing the steam or "compressed air or other motive power that may be employed "and time in reversing the action of the piston, besides maintaining the full force of the stroke at any depth of cut."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 22.—N° 2331.

HANDCOCK, Elias Robison.—This invention relates to an ngine of the rotary class, worked by steam or other motive power.

The engine consists of an outer cylinder containing an inner cylinder of such lesser diameter that an annular space is formed between them. Both cylinders are fixed on a concentric axis and revolve therewith within an outer case, which carries the bearings wherein the axis turns. The inner cylinder is partially divided by four quadrangular mortice grooves, which extend from end to end on the plane of the centre, leaving sufficient strength of metal round the axis. Four piston plates are fitted into these grooves; these plates extend the whole length of the inner cylinder into radial guides at each end; fixed studs project from the ends of each plate and carry small anti-friction rollers which, as the cylinders revolve, traverse a circuitous path in an eccentric cam, fixed inside the casing at each end, whereby during one-half the revolution, the outer edge of each piston plate in succession is kept in contact with the outer cylinder, having been projected across the annular space by the form of the cam paths, which also, at another part of the revolution, act convergently upon the piston plates, so as to cause them in succession to slide into the grooves until the outer edge of each plate is flush with the periphery of the inner cylinder. The cam path is formed to converge the plates in conformity with the curved surface of a fixed steam resistant stop, which separates the annular space at one part of the circuit. On each eide of this stop a separate port opens into the annular space, answering respectively, according to the desired direction of motion, for either the induction or exhaust. Divergent action is also given to the piston plates by the admission of steam into the grooves, and the numerous packings are made tight by the pressure of steam contained in hollows and grooves behind them; springs for the latter purpose may also be used.

[Printed, 1s. Drawings.]

A.D. 1864, September 28.—N° 2384. (* *)

WEEMS, John, and WEEMS, William.—" Improvements in " engine governors and in apparatus for indicating and regulating " the flow of fluids and liquids."

Part of this invention is based on one for which a Patent was granted on the 17th of March 1862, and numbered 734. The first part of this invention consists in applying for the governing of engines or waterwheels a flexible diaphragm fitted in a chamber. On the side exposed to the steam or water pressure is a spindle communicating with a throttle or other valve. The other

side is connected to a pump which, when set in motion, forces fluid against the diaphragm. When the engine has attained full speed, a "crane" or cock is regulated to allow the excess of fluid to escape. When the speed increases, that of the pump being increased also, more fluid is forced against the diaphragm which sets in motion the spindle controlling the throttle valve. Several modifications of this arrangement are described. The second part consists of a flexible diaphragm fixed in a metal chamber. To the diaphragm is attached a rod in connexion with a three or four way valve. The whole is so arranged that, as the parts work, a reciprocatory motion is given to the diaphragm, which being transmitted to an index, causes the flow of the liquid to be registered.

[Printed, 1*s*. Drawing.]

A.D. 1864, Setpember 29.—N° 2391.

CUTHELL, Alexander.—This invention relates to the construction of slide and cut-off valves for steam engines, whereby steam is at all times admitted to the piston at the pressure indicated in the boiler, a variable expansion effected, and the speed of the engine regulated, by reason of the cut-off part of the valve being under the influence of the governor. The induction passages are formed through the valve from back to face, clearing the exhaust chamber. The cut-off is a plate valve with steam ways, which coincide with the ways through the slide valve. This plate valve is so operated by the governor, that, according to the extent of motion, so in proportion will the steam ways through it and through the valve, remain more or less coincident during a greater or lesser portion of the stroke, according as, in order to maintain the normal speed of the engine, more or less steam may be required. A crank lever or quadrant fast upon the spindle is attached to the back of the plate valve. The spindle, which by partial turning operates the valve, passes through a stuffing box disposed on the centre of the slide box cover. A disc plate is fixed on the outer end of the spindle; on the face of this disc are two swivel blocks and studs, between which a tapered piece of metal, movable endways by the governor, is arranged to operate; this piece is guided in a frame, the upper part of which passes over the centre of the spindle. The invention, it is stated, admits of several variations and modifications.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 30.—N° 2410.

GRAVELEY, William Henry.—This is an invention of apparatus which is combined with steam power for various uses on board ship, and includes the distillation of sea water. It is described by the inventor as follows, " I place upon a condenser for " condensing steam from a boiler supplied with sea or other water " one or a pair of steam cylinders, and connect the plunger of a " pump with the piston cross head. The pump is made to draw " and force water into and through the condenser. I apply an " air dome, and when required the pump may be used as a fire " engine, or for pumping water to cleanse decks and closets and " for wetting the sails as may be required. On the crank shaft I " key two wheels with broad tyres or hoops, and carry belts from " them, or one of them, to drive a fan for ventilating the ship; I " also key on the crank shaft a toothed pinion which gears into " a toothed wheel on a shaft over the main hatch; this shaft is " used for hoisting cargo into and out of the ship. On both " sides of the machine this shaft carries a barrel and a chain " wheel; one chain wheel communicates motion through a chain " to the ship's pumps and the other to the windlass, while the " barrels serve for hoisting sails, warping the ship, and other " similar purposes."

" The engines may be worked as condensing or high-pressure; " when as condensing, the waste steam from the cylinders enters " the condenser, and the condensed water is aërated and passed " through a filter, as in the Specification of Letters Patent, " No. 1320, granted to me 28th May 1859."

" I generally use a steam cooking apparatus in conjunction " with the combined machinery herein-before described, and lead " the steam employed to heat the cooking apparatus into the " condenser."

[Printed, 10*d*. Drawing.]

A.D. 1864, October 4.—N° 2437.

HASELTINE, George.—(*A communication from Thomas Silver.*) —This invention relates to the construction of slide valves for steam engines, and the means whereby they are operated. The engine partially illustrated, is secured to a bed plate. The slide valve and ports are so shaped, that the supply of steam to one side of the piston promptly follows the exhaust from the other,

and the column of supply is made relatively less than the column of the exhaust. These objects are attained by constructing the ordinary slide valve of greater length, and forming a slot at each end for the passage of the steam, so that a portion at the side of the port remains covered by the valve, while at the same time the exhaust port is fully opened. If instead of a slot, portions from the corners of the valve surface be removed, the effect would be the same, or if the ports in the cylinder surface be elongated at each end, such elongations only to be uncovered by the valve for the admission of steam, while the larger portions would become the exhaust. The reversing link is of the ordinary form, but curved internally concentric with a joint in the valve rod. The gear which operates the link consists of a rack fixed upon the near edge of the link, and a pinion geared into it, which works on a pin projecting from the face of a disc. The pinion is attached to and actuated by a worm wheel, the radius of which extends to the centre or axis of the rocking motion of the disc, which motion is obtained from an eccentric. By means of an adjusting worm, which engages the teeth of the wheel, the travel of the valve is regulated. The arrangements can be modified so that motion is given direct to either end of the link by the rod of a single eccentric fixed on the engine shaft.

[Printed, 8*d*. Drawing.]

A.D. 1864, October 4.—N° 2441. (* *)

MONRO, Alexander.—" An improved mode of and apparatus " for heating steam boilers." The heat from the fuel is communicated to the boiler through the medium of a substance, by preference lead, which is fusible at the working temperature. Two instances of boilers worked in this way are described. A boiler, somewhat resembling a common two-flued boiler, has the bottom of the two-flues united to form a U-shaped flue, in the front end of which is the furnace. This flue is surrounded by two shells, the intervening space between which contains lead introduced in a melted state by pipes. Ducts are formed through the upper part of the boiler, communicating with the tops of the U-shaped furnace space, for the introduction of the coals. The tops of the ducts are fitted with doors, and a vertical grating, furnished with a series of plates, is adapted to the front end of the furnace. A marine boiler, with this lead bath, is shown with an internal furnace space occupying the lower part of the boiler, the fire gases

returning through tubes to the take-up. "The roof of the fur-
" nace space is made of a deeply-undulated form to give extended
" heating surface, and the roof and sides are made with two
" shells" with an intermediate space filled with lead.

[Printed, 10*d*. Drawing.]

A.D. 1864, October 4.—N° 2444.

REID, CHARLES HENRY.—(*A communication from Edward Clark.*)—(*Provisional protection only.*)—This invention relates to the prevention of leakage in the tubes of steam boilers and other tubular steam and water apparatus. It "consists in the employ-
" ment of short split tubes or rings, which are cylindrical outside
" and conical on the inside. The external diameter of these short
" tubes corresponds with the nterior of ne tubes of the boiler
" or other apparatus, but the short tubes are yet capable of being
" readily inserted into the ends of such tubes. The longitudinal
" splitting of the short tubes or rings is in an inclined direction,
" through the metal, so that the edges overlap each other, and so
" that the split will not be opened when a tube or ring is some-
" what expanded to cause it to fit closely within the end of a
" boiler or other tube. In addition to these short split tubes
" other short tubes are used, which are cylindrical inside and
" conical out, and they have each a flange at their outer ends.
" These tubes fit within the split tubes at their inner end, and
" their flanges extend over the outer ends of the tubular flues or
" other tubes fixed in the plate. In order to stop the leak of a
" tubular flue or other tube fixed in a tube plate a screw bolt and
" screw nut are used. On the end of the screw bolt is a cross bar
" or instrument pin-jointed to the screw bolt. This cross head or
" instrument can pass through the short tubes introduced into the
" end of a tubular flue when in one position, and then when opened
" out the ends of the cross head come against the end of the split
" tube. There is a second cross bar or crosshead or plate used,
" which rests against the outer surface of the flanged end of the
" second or inner short tube above described. In using this
" apparatus the two short tubes are to be introduced with the
" screw bolt into the end of the tube, and then the screw nut is
" to be turned till the split tube is drawn upon the inner short
" tube, and has by it been caused to expand to the requisite extent
" when the screw bolt, nut, and cross heads are to be removed."

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 6.—N° 2454.

GIBSON, JOHN WILLIAM.—(*Provisional protection only.*)—This invention relates to a particular mechanical arrangement for working the slide valves of steam and other engines, which consists in using but one eccentric fast upon the shaft, " so that the engine " will move backwards or forwards, while the necessary lap and " lead for expansion is preserved. To the end of the eccentric " rod a curved lever or link is attached, which link is carried on " or suspended to a lever which is worked by a stud in the eccen- " tric rod strap, or other portion of the machinery that will give " it the necessary throw or stroke, thus causing the centre por- " tion of the link or its point of suspension to travel backwards " and forwards for a distance equal to the linear advance of the " eccentric due to the lap and lead of the slide valve, while at the " same time the end of the link to which the eccentric rod is " attached can move backwards and forwards equal to the full " stroke of the eccentric or travel of the slide valve, causing a " similar but opposite motion in that portion of the link which is " the other side of the point of suspension. The connecting or " radius rod of the slide valve is free to move up and down in or " on the link, and it will be in backward gear on one side of the " point of suspension, and in forward gear at the other, while its " distance from that point on either side regulates the travel or " amount of expansion. If it is preferred, the slide valve rod " may be fixed vertically and the link and suspension lever caused " to move up and down on it."

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 7.—N° 2466.

STEEVENS, WILLIAM.—(*Provisional protection only.*)—This invention relates first, to portable steam engines, and second, to implements for steam cultivation. Instead of attaching the engine cylinder and working parts of the engine to the boiler, they are mounted on a plate bolted upon a strong horizontal iron girder frame, which supports the boiler and two large winding drums. The object of this arrangement is to avoid the strain which prejudicially effects the boiler, when the engine is attached thereto.

The cultivating machines consist of sets of ploughs and other implements. A strong iron frame supported on wheels, carries

two under frames, to which the ploughs or implements are attached. By means of strong screws acting upon suitable mechanism these under frames are raised or lowered by the husbandman, so that the ploughs and implements can be adjusted to position and fixed a proper depth in the ground, or when necessary raised above it, "without any balance of power or "tipping motion."

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 10.—N° 2494.

HUCH, Edward Heinson, and WINDHAUSEN, Francis.

This invention relates to machinery for obtaining motive power, by the expansive conjoined forces of heated gases and steam. The engine comprises a vertical cylinder and a truncated piston, to which the lower end of the connecting rod is jointed, the upper end being coupled direct to the crank shaft above. The trunk end, attached to the upper side of the piston, forms an annular space between itself and the cylinder, and works out through an annular packing in the cylinder cover; in this annular space steam operates upon the piston. The outside of the hollow trunk end, attached to the under side of the piston, fits and slides against the sides of the cylinder; this trunk end descends into an annular recess formed by a cylindrical water chamber concentrically disposed at the bottom of the cylinder, through which, rising concentrically up from below the cylinder end, is a tubular passage which opens within the trunk above the water chamber. Through this passage the heated gases evolved in a contiguous furnace are caused to flow in regulated quantities by means of a distributing valve interposed below the cylinder. The up stroke of the piston is produced by the admission of the heated gases into the lower trunk beneath it, where also the exhaust steam from the annular space above (after having operated above the piston for the downward stroke) finds its way, and commingling with the heated gases is regenerated. The exhaust passage opens at the completion of the stroke to the condenser, which is combined with a steam generator. It consists of an upright cylindrical chamber, closed at both ends respectively by a tube plate; it contains an inner cylinder of much smaller diameter which is attached to and open at each end through the tube plate. The annular surrounding water space is filled with vertical tubes, through which the gases exhausted from under the piston are directed, whereby steam

is generated for operating above it. The inner cylinder is furnished with a series of shallow dishes, formed circular and annular, alternately fixed in the centre and to the sides. The cold water enters through a central tube attached to the cover and falls amongst the gases (rising from the tubes of the generator) into the upper central dish, whence it flows in showery particles over the edge into an annular dish; from this receptacle it falls over the inner edge into the next, which is a central dish, and thence into an annular dish and so on to the bottom, mixing with and condensing the exhausted gases on their way to the air pump, which is single acting. The working parts generally are kept cold by water contained in casings, and the distributing valve is furnished with a passage for a cooling water flow. All the passages and cooling water flow are in communication with the generator. The constructive details of the invention are susceptible of various modifications.

[Printed, 1s. Drawing.]

A.D. 1864, October 11.—Nº 2502.

ADAMS, Thomas, and PARSON, George John.—This invention relates to the so constructing slide valves, that the steam or other fluid pressure on one side or face of the valve, is simultaneously counteracted by fluid pressure on the opposite face. "For this purpose the two ends of the valve, at which steam is "admitted to the cylinder, are bevilled off or formed so as to "leave a small space for the admission of the steam from the "boiler, which steam presses on such ends in a direction opposite "to that in the ports of the cylinder, thereby diminishing the "resistance to the sliding of the valve, as required, between the "face plate of the valve box and the cylinder face. The steam "space thus formed at each end of the valve is or may be equal "in area to the steam port on the opposite side of the valve, and "the steam in such spaces is prevented from passing into the "valve by means of a ring inserted and fixed in the central part "of the valve between the two ends thereof. This ring is formed "in parts, with two surfaces fitting accurately the face plate of "the valve box and the inner side of the valve, against which "respectively it is pressed by springs or packing, or the ring itself "is made to act as a spring, so as to make such part steam-"tight. The centre of the valve inside the ring is open and is

"pressed upon equally on all sides by the exhaust steam, the "pressure being also equal at each end of the valve."

[Printed, 2s. 4d. Drawings.]

A.D. 1864, October 13.—N° 2527.

HENRY, MICHAEL.—(*A communication from the Société E. Gellerat et Compagnie.*)—This invention, which relates to steam machinery for rolling roads and ways, is also applicable to steam carriages adapted to common roads and surfaces. The rolling machine comprises a longitudinal frame which carries at one end a boiler of the locomotive class, and at the other end the water cistern and accomodation for fuel. The engine cylinders are arranged about the centre of the frame, which is sustained by the axles of two large rollers or drums transversely disposed, one beneath the boiler and the other below the fuel box. Each drum is connected with a chain wheel, to which, by means of strong chains, the power is transmitted from chain pinions fixed on shafts driven by the engine, which acts thereon through either of two sets of differential gearing, whereby the power is increased and speed diminished, and vice versa. When required to deviate from a straight line or to turn the machine, the axle boxes on one of the side frames are caused to converge or diverge, as the case may be, according to the required direction of motion. This movement is effected by means of a rod, the ends of which are respectively screw-threaded right and left, and screw into links connected to the movable axle box or carrier. The rod carries a toothed bevel wheel, to which motion is imparted by means of a bevel pinion fixed upon a vertical shaft actuated by hand.

When applied to traction or portable engines, the chain wheels are fixed mid-length upon the main axles, and all four wheels act as driving wheels. The arrangements for converging or throwing the axles out of parallel with each other are varied and the parts otherwise modified.

[Printed, 8d. Drawing.]

A.D. 1864, October 13.—N° 2528.

ROBBINS, JAMES.—(*Provisional protection only.*)—This is an invention of steam power apparatus for driving and drawing piles. It "consists of a cylinder fitted with a piston having one or two "piston rods, ... that is to say, I employ either a plate or

" piston without a rod, or a rod on one or both sides of said plate " or piston. To said piston or rods, plate or piston, chains or ropes " are attached, and are connected to falling weights or monkeys " similar to those at present used in pile-driving engines. The " aforesaid cylinder may be placed either horizontal or vertical; " if vertical, a chain, rope, or self-acting clams, or a grip, may be " actuated by the piston when a piston rod or rods are not used. " Steam, air, or other motive power is admitted or driven into " said cylinder, or compressed therein, or exhausted therefrom, or " cut off from the back of or on one side of the single-action " piston, and alternately on either side of a double-action piston. " The power is cut off from or exhausted on one side of the " piston, and admitted or allowed to act on the opposite side, " thereby driving the piston and raising the weight or monkey " connected therewith; said weight or monkey may be detached " by self-acting clams or otherwise, and be allowed to descend as " may be required. In using atmospheric air as the motive " power, a vacuum being formed at one side of the piston and " the air admitted on the other side, a force will thus be exerted " on the piston nearly equal to the pressure of the atmosphere." " By these means several piles may be driven at one time, or only " one at a time, as may be required."

[Printed, *4d.* No Drawings.]

A.D. 1864, October 15.—N° 2550.

WISE, FRANCIS.—(*Provisional protection only.*)—This invention relates to boilers and apparatus for generating steam, and " consists " in the employment in such boilers of two thin plates placed " vertically (or nearly vertically) side by side between adjacent " vertical rows of tubes, such plates having a space between them, " and being kept at the requisite distance apart by suitable dis- " tance pieces, so that as the water surrounding the tubes situated " in the intervals between the several pairs of plates becomes " heated and rises towards the surface, corresponding currents of " less heated water may be guided uninterruptedly downward " between the plates of each pair (between the lower edges of " which and the shell of the boiler a suitable space is left) to " supply its place. It is preferred that the upper edges of the " plates shall be turned or bent over so as to be curved or flanged " outward, that is to say, towards the tubes for the purpose of " deflecting the bubbles of steam ascending from the surfaces of

" the tubes, and preventing their interference with the currents " descending between the plates."

[Printed, 4d. No Drawings.]

A.D. 1864, October 17.—N° 2555.

CALVERT, Francis Alton.—This invention, relating to engines for obtaining motive power, "consists in supplying the " cylinder with water until the crank has attained about its full " leverage, when the impact of steam, water, or other compressed " fluids can be advantageously applied to the piston or plunger, " thereby avoiding all vacant spaces, such as portways and " working space, until about the full leverage of the crank is " attained." The cylinder is open at the top and closed at the bottom by a foot valve "which answers the purpose of the breath- " ing valve described in the Specification" of a prior Patent granted to this inventor October 21, 1861, No. 2625. The cylinder is mounted on the top of the water cistern, whereon the supporting standards of the crank shaft are fixed; a connecting rod coupled to the crank transmits the motions of the piston; within the cylinder between the piston and the foot valve is a piston float. When the piston has turned for the downward stroke, the foot valve is opened by a cam, in order that the water may escape as the float descends which in so doing uncovers the exhaust ports, consisting of a series of small holes in the side of the cylinder, covered by a flap valve. The air or steam escaping is conveyed by the exhaust pipe to the cistern. The piston is close to the float when the up stroke commences, and as the piston rises the exhaust ports are closed by the flap valve, and the float being raised by the vacuum formed between it and the piston, causes the foot valve to open and the water from the cistern to fill the space under the rising float. When a certain part of the stroke most favorable for leverage on the crank has been reached, steam or other expansive fluid is admitted below the piston through a series of port holes about midlength in the cylinder side. The space between the float and the piston, in consequence of the former having followed the piston and the water having risen after the float, is no larger than the ordinary space at the end of a stroke between a piston and a cylinder end, so that the full power of the steam immediately bears upon the piston at the most favorable position of the crank. The float may be dispensed with when water under

pressure is the motive power. The position of the cylinder does not effect the working of the engine.

[Printed, 10*d*. Drawing.]

A.D. 1864, October 18.—N° 2569.

ZEH, JOHANN.—This invention relates to movable grates or fire-bars, for furnaces and fire-places.

1st. The longitudinal inclination of the fire-grate surface may vary from 15 to 36°, the thickness of the layer of fuel supplied, and the rate of movement of the grate bars being augmented in proportion to the decrease of inclination.

2nd. The grate bars may be disposed across the furnace, and made to rock or oscillate by suitable means, or a reciprocating motion may be imparted to the range of fire-bars, either intermittently or continuously, by power or otherwise.

3rd. The fuel is supplied from a hopper disposed in front, over the entrance to the furnace, and in order to prevent any accumulation of fuel in the fore end of the furnace, an additional inclination is given to the fore end of the grate surface.

4th. A receptacle is formed at the back of the furnace to receive the solid residue of the burnt fuel, which falls therein off the end of the grate bars.

5th. In order to prevent choking at the sides and ends of the fire-grate surface, the bars and sides of the grate are caused to project, for the purpose, when the grate surface moves, of scraping off all lodgment of the ash or fuel.

6th. Relates to arrangements adopted and proposed for facilitating the shifting or removal of one or more bars when necessary.

7th. Relates to the adaptability of the invention to all kinds of furnaces and fire-places, the conditions of complete combustion for all kinds of fuel being always the same.

8th. Relates to the simplicity and durability of the invention, the latter being ensured by disposing the operating mechanical details beyond the reach of the fire, and because, by the movements of the grate surface, all scoria is removed therefrom, and the air passages are kept free.

Modifications of the invention adapted to locomotive, marine, and other steam boilers and furnaces, and also a great variety of constructive details, are fully illustrated and described.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1864, October 20.—N° 2596.

NEWTON, William Edward.—(*A communication from Jean Joseph Molard.*)—This invention relates to that class of rotary engines, worked by steam or other elastic fluid, known as direct-action rotary engines, or as disc engines. "The body or cylinder " of the engine, which is made hollow, is mounted and rotates in " bearings at its extremities, the extremities themselves, which " are made smaller than the middle, forming the trunnions. " In these hollow trunnions the induction and eduction pipes " are situate. The driving piston (which consists of a hollow " sphere, provided with a disc and a wing, or partition, to be " acted upon by the motive fluid, and having two openings for the " admission and emission of the motive fluid), is mounted inside " the main cylinder at an angle to it, the axles of the piston " resting upon recesses made for that purpose in the supply and " exhaust pipes at each side. The middle of the cylinder is made " in the form of a pulley, for the double purpose of receiving " the piston, and also of transmitting the motive power to any " machinery to be driven. It is hollow, and its sides are inclined " inside, for the purpose of allowing the piston to be set at an angle " to the body of the engine. It will now be understood that " upon steam or other motive fluid being supplied by the pipe at " either end (according to the direction in which the engine is " required to rotate) it will enter the hollow spherical piston, and " in making its exit therefrom will impinge upon the partition " or wing of the piston, and will thereby cause the cylindrical " body of the engine to rotate in its bearings, which rotary motion " may be communicated to any machinery to be driven by adapting " a driving band to the pulley-formed cylinder, or by providing " such pulley with cog teeth, or any other suitable means for " transmitting motion." A modification consists in making the body of the engine stationary and the piston to rotate. For working steam expansively two engines, one smaller than the other, are arranged to act conjointly upon one shaft; the steam after operating in the small engine, exhausts into the other or larger engine where it works expansively, and then passes on to the condenser.

[Printed, 1*s*. Drawing.]

A.D. 1864, October 21.—N° 2603.

GWYNNE, James Eglinton Anderson.—This invention relates to various improvements in the construction of centrifugal

acting machinery, applicable to pumps, fans, turbines, and similar apparatus or machines, combined or not with steam power.

1st. The outer cases of centrifugal pumps and similar machines are so arranged, that by the removal of a segmental portion, the revolving wheel or disc which carries the curved vanes, and also the spindle, may be readily lifted out and replaced without interfering with or disturbing the suction or discharge pipes, or otherwise deranging the other portions of the apparatus. The major portion of the outer case, and the supporting brackets which carry the spindle, are cast in one piece with the base plate. A cock is fitted to the upper part of the case for charging the pump before starting, and another to the bottom part of the case for the purpose of emptying when required.

2nd. Relates to the construction and configuration of the curved radiating arms or vanes of the revolving disc, so that, avoiding concussion they may act gradually, easily, and rapidly upon the fluid, one edge of the arm being in advance of the other.

3rd. Applies centrifugal pumps to the working of steam engine condensers, by causing a portion of the water raised by the pump to pass through the condenser as condensing water, for which purpose suitable pipes, forming communications between the suction and discharge pipes of the pump and the condenser, are employed, whereby a constant circulation of cold water is kept up. On ship board, the waste water may be so discharged in a lateral direction, as to act as a helm, or the water heated in the condenser may be returned to the boiler. In some cases the steam engine, pump and gear, are all mounted upon one bed plate.

4th. Relates to pumps mounted on vertical axes, as described in the Specification of a former Patent granted to this inventor, bearing date April 29, 1862, No. 1248. According to the present invention the disc wheel is made with a long neck to allow for wear, and a spiral or tapered screw instrument is fitted concentrically to the underside to act as a boring tool, for the purpose of loosening and removing sand, gravel, and other similar bodies, which are brought up with the water. Pumps when employed in making excavations, such as sea walls, harbours, and other similar works, are so arranged as to be capable of being readily raised and lowered, and the discharge pipe is lengthened, either by fitting pipes together on the telescopic-slide principle, or otherwise.

The disc wheels are made of cast steel.

[Printed, 1s. Drawing.]

A.D. 1864, October 21.—N° 2605.

PAVIOLA, LAURENT.—This invention relates to an "anti-saline "coating chiefly applicable for preserving from corrosion and "incrustation the boilers and pipes of marine steam engines." This coating "is composed of alum and of white powder of "saponaria, mixed and dissolved together in soft water, and in "equal proportions, and not only has the property of preserving "the metals composing the body of the boiler and its apparatus "from the corrosive action of the salt," but also removes the salt coatings or incrustations formed in the interior of the pipes and the body of the steam boiler. This anti-saline coating is prepared as follows:—"The alum is melted in soft water in a "state of ebullition, the powder of saponaria, or still better the "plant itself, is then introduced, and the boiling continued until "perfect extraction of the essence contained in the said plant, "which is then thrown away. The coating thus made may be "applied with a brush, or in any other convenient manner."

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 22.—N° 2618.

BIRD, HENRY.—This invention relates to breaks for stopping locomotive engines, carriages, and trains, by the application of steam. Three kinds of breaks are described, viz.:—

"The engine break." A steam cylinder is fixed vertically in front, under each of the buffer beams of the engine. The piston rod of each is so attached to the break apparatus on each side, as to cause the pressure of the breaks on the wheels when steam from the boiler is admitted by means of a three way cock into the cylinder behind the piston, which at the same time so acts direct upon the end of a bent lever, as to cause a break block attached thereto to press upon the rails. This and the other breaks are under the control of the engine driver and the stoker.

"The single carriage break" is operated by a double-action steam cylinder with two pistons, transversely disposed mid-length under the carriage. The piston rods are attached respectively to the centre of a bent spring, the ends of which are connected to the rods which operate the breaks. These springs are disposed respectively at the sides of the carriage, and when stra[illegible] by the thrust of the pistons, cause the breaks to p[illegible] wheels, and by their reaction when the steam is [illegible]

allowed to escape, withdrawing the breaks from contact. This break apparatus may be operated by steam from the engine boiler, or from a small boiler placed in the van or carriage to which it is applied.

"The connecting or train break." Centrally under the back frame of the tender, is longitudinally placed a steam cylinder, the piston rod of which passes out at each end through suitable stuffing boxes. One end of the piston rod is connected to the break gear of the tender, and the other end to a system of breaks, which operate after the manner of crane breaks upon drum pulleys fixed mid-length upon the wheel axles of the carriages.

These breaks may be operated by steam or by hand.

[Printed, 10*d*. Drawings.]

A.D. 1864, October 24.—N° 2629.

SCHORB, Georges.—This invention relates to a "rotary engine "actuated by the double action of steam or any other moving "fluid." The cylinder of this engine, unlike others of its class, revolves round a fixed piston; portions of its inner surface are removed by forming four longitudinal recesses, each one in relation to the others at right-angles with the centre, or 90° apart; these recesses receive four resistance flap stops, which operate similar to the action of a flap valve and which, in succession as the cylinder revolves, are forced by springs across the annular space between the cylinder and the piston. The extreme length of radii of one diameter of the piston corresponds with the internal diameter of the cylinder, the other radii, at right angles with the former, are much shorter, so that a space narrowed by the somewhat elliptic configuration of the piston, which is curved divergently in either direction so as to unite the shortest to the longest radii, is left on opposite sides between the piston and the cylinder; the constant action of the springs upon the axes of the resistance flap stops, tends to press their free edges, which carry packings, constantly against the periphery of the piston, the form of which keeps them in the required position and presses them into their respective recesses while passing its longest radii. A constant admission of steam is simultaneously entering the space on each side of the piston, so that it operates at the same time on opposite sides in succession, during a quarter of a revolution, upon the revolving resistant flap stops, and intermediately exhausts. All the moving rubbing surfaces are furnished with metallic packings,

to receive which the bottom and cover are concentrically grooved; springs and screws are used to press the packings up to the surfaces against which they rub. "Double action" means the constant action of the steam upon the two opposite resistant surfaces at one and the same time.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, October 24.—N° 2632.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Auguste de Bergue.*)—(*Provisional protection only.*)—This invention relating to "apparatus for consuming smoke in steam boiler "and other furnaces and fire-places . . . . . consists in "forming chambers or hollow partitions in metal or refractory "material between the fire-place and the draught to the chimney, "and in the employment of hollow sectors or tubes supported by "and passing through between the chambers or partitions. The "sectors or tubes should be partly covered by or enter at bottom "a layer of ashes or cinders before the fire is made up. When "the fire is lighted the current of air entering by the furnace "door impinges upon the burning fuel, and directs the flame and "other products of combustion into the chambers or hollow partitions near their upper part; the products of combustion pass "down these chambers, then through the layer of ashes beneath "the burning fuel into the hollow sectors, and thence into the "flues."

[Printed, 4d. No Drawings.]

A.D. 1864, October 25.—N° 2644.

CLARK, WILLIAM.—(*A communication from Francis Bernard de Keravenan.*)—This invention, relating to a rotary steam engine, which may also be adapted as a pumping or blowing apparatus, consists of an outer fixed cylindrical casing, and an inner cylinder or drum mounted upon an axis, which passes concentrically through stuffing boxes fixed to the sides of the casing, and is supported in bearings attached to the framing. Between the outer casing and the inner cylinder there is formed an annular space, around which the piston, which is attached to the periphery of the inner cylinder and projects across the ann[illegible] lides in steam-tight contact with the sides of the [illegible] against its internal circumferential surface. An

resistance slide, fitted into a radial recess formed upon the outer cylinder, is caused to project across the annular space against the periphery of the inner cylinder, by the reaction of two helical springs, and it is raised at the proper moment to allow of the passage of the revolving piston, by the latter, the front face of which is inclined so as to act as a wedge. The steam introduced to follow the piston, comes through one side face of the slide, which also acts as a valve, the exhaust either passing off through a separate passage on the other side of the slide, or by means of a contiguous pipe. Modifications are shown and illustrated.

[Printed, 2*s*. Drawings.]

A.D. 1864, October 28.—N° 2666.

LAIDLAW, DAVID, and ROBERTSON, JAMES.—This invention relates to apparatus for exhausting, forcing, compressing, heating, cooling, and applying aeriform bodies. When gas or air is to be compressed or forced into small bulk, it is proposed to employ a quick percussive action. The modification described as applicable to the purpose, operates in the same manner as an ordinary steam hammer. The compressing plunger or piston is attached to the lower end of the piston bar or rod, and the compressing cylinder is disposed concentrically beneath the steam cylinder. The steam valve is moved by a two-armed rocking lever, tilted by an adjustable piece on a rod, and acting upon the valve by means of links and levers. The ordinary valve gear of steam hammers may be used. The compressing plunger and rod are made to assist by their weight in increasing the effect of the compressing downward stroke. The air issues through a loaded valve, passing through plies of wire gauze, which act in the cylinder as a cushion for the piston. The compressing cylinder and air passages are enclosed by a casing, which is kept constantly filled with cold water, in order that the great heat generated by the compressing operation may be absorbed. The air highly compressed may be conveyed through piping to a distance for working engines for hoisting, pumping, pressing, coal cutting, and other similar purposes, including the raising and forcing by surface pressure, of corrosive and other liquids.

A modifiication of the invention is described as applicable to gasworks for exhausting illuminating gas. Amongst other modifications, adapted to various practical purposes, is described as apparatus for cooling, refrigerating and freezing by the re-expan-

sion of compressed air, which is deprived of its caloric whilst under compression, in order that when re-expansion takes place, it may exert its greatest cooling effect.

[Printed, 2s. 6d. Drawings.]

A.D. 1864, November 1.—N° 2699.

IVORY, Thomas.—This invention, which relates to steam engines, steam boilers, and condensers, is in part applicable to pumps.

1st. The working of the valves of engines having two cylinders placed end to end, as described in the Specification of a prior Patent granted to this inventor in the year 1863, No. 2437. These engine valves are worked by means of lazy-tongs, interposed between the valves and valve rods, and operated by a cam shaft, which receives motion from the engine, whereby more rapid opening and closing of the steam passage, by the accelerated movement of the valves, is effected.

2nd. Applies the same mechanism to steam engines generally, and to force pumps.

3rd. Applies and adapts a separate pair of valves to the steam ports, another pair to the exhaust ports, and a third pair to the passages through which the high-pressure steam passes from the high-pressure to the low-pressure cylinder, each pair of valves being worked independently.

4. Relates to exhausting steam from expansion cylinders direct into the atmosphere or condenser through openings in the cylinder.

5th. Uses revolving cocks or valves instead of slide valves.

6th. After the completion of the high-pressure stroke, allows the high-pressure steam to flow into the expansion cylinder, the communication between the cylinders being opened before the high-pressure port is closed.

7th. Assists the stroke of the piston in the expansion cylinder by means of a counterbalance weight attached to a lever, or to the engine shaft or the fly-wheel, which weight is lifted during one half its revolution, whilst the high-pressure piston makes its stroke, and is descending, and returning the power which raised it, during the stroke of the piston in the expansion cylinder.

8th. Is a modification of the last arrangement.

9th. Closes the outer end of the high-pressure cylinder, and forms therein a cushion of compressed air to assist the reciproca-tion of the expansion stroke.

10th. Closes the outer end of the expansion cylinder, and opens therewith a constant communication with the condenser.

11th. Relates to the use for the force pumps, of slide valves actuated by a revolving or reciprocating shaft or rod.

12th. So connecting force pump valves together, that all are caused to move simultaneously.

Boilers and Furnaces. 1st. An arrangement for separately burning the coal and coke in the fire-boxes of steam engines ; supplying air, feeding, and raising the coke. 2nd. Using for the sides of flues in boilers, narrow vessels or chambers forming thin water spaces, and so fixing heat conducting rods through the narrow chambers, that their ends project considerably into the flues. 3rd. Relates to the use of heat-conducting rods placed across narrow fire-ways, so that their ends project into water space on each side. 4th. Two boilers are contiguously combined ; one contains the furnace and steam space, and the other, disposed at a suitable level, is filled with water and contains the fire-tubes for the return fire draught. 5th. Constructing a return multitubular fire draught way between the furnaces of double flued boilers.

Condensers.—Arranging an air-tight case which contains water tubes and a central space, into which the exhaust steam is admitted in a direction parallel with the tubes.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, November 2.—N° 2711.

DRURY, John.—This invention relates to the pistons and air pumps of steam or other motive-power engines, and in the application thereto of a peculiar form or construction of metallic packing, capable of receiving and retaining oil or other lubricant. This packing consists of " one ring of sufficient breadth to fill " betwixt the top and bottom flanges of the piston or pump " bucket cut at one part to allow expansion in the usnal manner, " each side of the cutting being provided with a block or break " joint piece. This ring is grooved or recessed in its external sur" face, nearly the whole extent of its circumference so as to form a " reservoir or receptacle for oil or other lubricant, which is supplied " by a pipe or pipes attached thereto, and extending sufficiently " above to pass through an opening or openings in the cylinder " cover when the piston or bucket is raised to the top, the tubes " and openings being provided with steam-tight covers. Or the " lubricant may be supplied through a hole bored longitudinally

"in the piston or pump rod, and connected by a pipe or pipes "to the recess in the packing ring. By this means the lubri- "cant may be applied to the inner surface of the cylinder without "being brought into direct contact with the steam or other motive "power element, and thereby prevent undue waste of the lubri- "cant."

[Printed, 8*d*. Drawing.]

A.D. 1864, November 4.—N° 2738.

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only*.)—This invention relates to obtaining motive power from steam, aeriform fluids, and liquids, having for its object the use of such fluid or fluids at a high degree of temperature. Several methods and arrangements of construction are described. The first consists in admitting steam or vapour into the upper part of a cylinder, in which a piston works vertically. "Attached to this "piston on its upper side is a cylindrical body nearly fitting the "cylinder, but not touching it; and between this inner cylindri- "cal body and the cylinder is liquid whose boiling point is higher "than that of the vapour employed. This cylindrical body is of "greater length than the stroke, so that the piston and the lower "part of the liquid never come in contact with that part of the "cylinder with which the heated steam or vapour comes in con- "tact. The upper part of this liquid is heated by the vapour "which comes in contact with it, and may be heated by other "means so as to be kept somewhat higher in temperature than "that vapour, whilst the lower part is kept cool by conduction "from cool liquid, so as to have a temperature at which a piston "can be worked without difficulty in a cylinder. To impede "circulation of this liquid, liquids of two specific gravities may be "employed, the heavier being at the bottom. The heat abstracted "from the liquid for the purpose of cooling it may be utilized by "employing it to heat the liquid made use of in the boiler, or to "generate inflammable vapour, which may be used as fuel. "Two pistons of this kind may be employed connected with the "same axle or machine, one performing work while the other "makes the return stroke. And any number of such pistons may "be employed to work a common axle, or give motion to one "machine. A piston of this description may be employed as the "rod of a valve." The valves employed slide horizontally and when closed are surrounded with liquid, so that the aeriform fluid

cannot find a way between the valve and its seat; the liquid is displaced before the valve opens. Other valves and vessels for operating highly heated fluids are described.

[Printed, 4*d*. No Drawings.]

A.D. 1864, November 7.—N° 2751.

THRIFT, WILLIAM.—This invention of a rotary steam engine, pump, or blast, consists of an outer cylindrical casing, fixed upon a suitable foundation. A horizontal axis, resting in stuffing boxes fixed respectively to the ends of the casing, passes concentrically through it, and carries within the casing a piston wheel. This wheel is fixed upon the axis, and is so much smaller in diameter than the interior of the case, that an annular space is formed between them. This space at one point is closed by a steam resistant piece, which extends about one-third round the internal circumference of the case, and is fixed thereto. The interna surface of the steam resistant, is cut away in a hollow curve an equal distance from each end, so as as to bring the part, which touches and slides with steam-tight contact against the periphery of the piston wheel, to a narrow surface. There are four pistons, two to act in one direction, and two when the direction of motion is reversed. These pistons are fitted, after the manner of flap valves on fixed hinged centres, into recesses formed in the periphery of the piston wheel, and their free ends are in succession as the wheel rotates, projected or opened against the internal surface of the casing, so as to bar the passage of the steam from the inlet port, which opens into the casing at a suitable angle on the afterside of the narrow surface of the resistant piece, the exhaust port being on the opposite side. By these means the piston wheel is driven round, the pistons as they slide round the annular space, being gradually closed or converged into their recesses in the wheel by the curved form of the resistant piece, and caused to diverge after passing the central ridge or surface, by slight helical springs. Packing blocks, which act divergently as packing wedges, are by means of helical springs which abut against the axis, caused to press against the sides of the piston wheel by the outward inclination or shallow conical form which is given to the sides of the cylindrical case. When motion is reversed, the steam inlet becomes the exhaust port, and the latter admits the steam.

[Printed, 1*s*. Drawings.]

A.D. 1864, November 7.—N° 2756.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Alix Laconfourque and Grand Perrin.*)—This invention relates to an incombustible packing for stuffing boxes. It is manufactured from metallic thread, " which retains the advantages due " to a filimentous form. The fineness of the thread affords flexi- " bility to the packing without the disadvantage of being com- " bustible. The stuffing box is provided on the inside with a " metallic thread rolled in multiple spirals; upon this thread I " place a ring composed of rope or strands of textile or mineral " material, such for example, as amianthus."

[Printed, 6*d*. Drawing.]

A.D. 1864, November 8.—N° 2764.

ADAMS, WILLIAM BRIDGES.—This invention relates to various devices connected with locomotive engines and railway and other trains, the object being to diminish wear and risk on railways, tramways and common roads. It consists 1, of an arrangement of under frames, for enabling the wheels of railway carriages or wagons to turn on a centre, so as to place their axles true to curves or straight lines, when guided by the traction rod or otherwise. A fixed central turning pivot is provided for the frame, or otherwise, curved guides for the axle boxes to play against. 2. An arrangement of brakes attached to the frames follows the curved movement of the wheels; the brakes by means of weighted levers always press upon the wheels, and when not required, are lifted either by the traction rod or by chains and pulleys, operated by guard or driver, either by hand or steam. 3. Arranging on six or more wheels, long carriages, which for facile transit may be built in lengths and joined together afterwards, the centre wheels being fixed in horn plates. The axles of the end wheels are provided with curved beds, which slide fore and aft between curved plates attached to the frame and keep the axles true both on curves and straight lines, free movement being allowed to the springs. Also the application of similar springs and curved axle beds to locomotive engines on eight or more wheels, either with or without friction wheels to give movement and guidance. 4. Arranging " guiding frames to wheels, the centres free, and the end frames " slot pivotted to the centre, and sliding through curved guides." 5. An arrangement, applicable to engines or carriages, of springs

and wheels with long swinging shackles and ball and socket attachments, guiding quadrant irons pivotted over the inner axles and working between guides, with outside guards to keep one axle in gauge with the body, while the other swings round it for working either straight or curved lines. 6. Constructing locomotive boilers with transverse partitions, for the purpose when the boiler is ascending or descending inclines, of breaking the surface level of the water into a series of levels or steps, and so prevent the displacement or flow of a greater portion of the water towards one or other end of the boiler.

[Printed, 1s. Drawing.]

A.D. 1864, November 8.—N° 2772.

BECHEM, AUGUST, and WEDEKIND, HERMANN.—This is an invention, in combination with a steam engine, of a rectilineal series of rolling apparatus, comprising a number of frames, each containing sets of two or more grooved rollers, whereby long lengths of metal wire, suitable for telegraphing and other purposes, are by passing and repassing through a detached single set of three rolls, and afterwards passing in succession through the different sets of the series, during one heat, reduced from the size of the heated billet to the dimensions and section of the wire required. A steam engine of 80 horse-power, making 100 revolutions per minute, transmits motion to a set of three roughing rollers, the axis of the centre roller by means of a clutch forming a prolongation to the crank shaft of the engine, and driving the other two, or top and bottom rollers, by means of broad toothed gearing. These rollers are about 10 inches diameter and furnished with flat grooves. The billets of metal, previously rolled to two inches square (in transverse section) are cut into lengths weighing about 40 lbs. each, and heated to a welding heat in furnaces contiguous to the set of roughing rollers. Between these rollers the billets in succession are passed five times, passing thence to the first frame of the series, the rollers of which revolve at the rate of 400 revolutions per minute. Through the rollers in this frame the metal is passed four times, the end being coiled over and re-entered; thence it passes to the second frame, then to the third, and so on to the last, upon leaving which it is received and coiled upon a drum, still at a red heat and reduced to $\frac{3}{16}$ths of an inch in diameter. Means for guiding the wire into the

grooves of the several sets of rollers in succession, and from frame to frame are provided.

[Printed, 1s. 2d. Drawings.]

A.D. 1864, November 9.—N° 2779.

GALLOWAY, George Bell.—This invention relates to the production of motive power, by the use of atmospheric air in connection with water under hydraulic pressure, and also to the means for the prevention of boiler explosions. Reference is made to former Letters Patent granted to this inventor dated respectively October 31, 1857, No. 2765, and March 15, 1859, No. 651, which relate to the propulsion of vessels, steering appliances, and boiler explosions. Regarding the present invention, the engine for marine propulsion is of the rotary class, similar in form to those in use but differing in the internal arrangement, the construction being similar to a water wheel, upon the arms and cellular spaces or buckets of which, the full impulsive force of the steam, water, or air is directed. The frictional surfaces are relieved by the application of metallic rollers clothed with india-rubber, so that travelling surfaces are presented to the revolving piston or cylinder. The pump is constructed with a valve both at top and bottom, each acting in unison with the strokes of the piston, whereby the assistance of the pressure of the atmosphere is obtained to assist the motive power in compressing at each stroke of the pump, in either direction, both water and air, which are received and compressed and leave the pump through two delivery pipes, wherein there are valves which open and close with the action of the piston. These pipes lead out below the stern of the vessel, where the compressed air and water issue with force against the external water and so causes propulsion. Steering is effected by the force of compressed air and water which, through pipes suitably applied, issue laterally from the stem of the ship and also, if required, from or about the stern post in the same lateral direction. Boiler explosions are prevented by drilling the rivet holes about two inches from the edge of the plates; also by applying internally, soda ash or other suitable matter to prevent incrustation, and putting within the boiler ligneous or other substances, such as manganese or similar matter in a liquid state, in order to change the quality of the water; also by the use of a metallic conducting wire, which is passed

through the shell of the boiler, drawing off the electricity generated therein; extra strengthening is given to the boiler by covering the seams with plates of iron or steel.

[Printed, 4*d*. No Drawings.]

A.D. 1864, November 10.—N° 2789.

ROBINSON, John, and GRESHAM, James.—The object of this invention, which relates to improvements in that apparatus for raising and forcing fluids and feeding steam boilers, known as "Giffard's Injector" consists in dispensing with the necessity for the internal packing hitherto used in connection with the different modes of construction, and in the arranging of the hollow discharging cone and the receiving cone or nozzle. In the present construction and combination of the apparatus, the hollow partition cone is fixed so that the steam is adjusted by means of the central cone spindle, and the discharging cone is so arranged as to be movable without packing, independent of the receiving cone which is fixed. By making the angles opposite the nozzle of the partition cone more obtuse, a shorter range is required for adjustment. The discharging hollow cone is made in two parts, one which forms the smaller end is made adjustable by various means within the other part, which forms the larger end and is fixed in position, and by so arranging that the movable part will extend only a little past the nozzle of the partition cone when the space for liquid is fully open, it is found that no packing is required, as at that point the jet or current has attained a high velocity, and has rather a tendency to suck or draw in any accidental overflow. 2. Consists in arranging and combining with the Giffard injector, discharging and receiving cones each made in two parts, the internal part which is adjustable, forming the small end, and the external part, the larger or fixed end of each cone; the internal parts move together and may be made in one piece; no packing is required. 3. Consists in arranging the nozzle of the adjustable part of the discharging cone to fit as a valve into the nozzle of the receiving cone, so that when the injector is at work the communication with the atmosphere may be closed. A variety of mechanical devices are shown for operating the adjustment of the internal nozzles. Modifications are also described and illustrated.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1864, November 10.—N° 2796.

SIMES, JESSE.—(*Provisional protection only.*)—The main object of this invention, relating to steam and other power engines, is to prevent loss of power caused by the escape of steam through the packings of the pistons and other parts. "For this purpose the "piston is formed with an extended flange or cylinder to dip "into mercury to a depth dependent upon the pressure of the "steam or other motive power employed, which in acting on the "piston may pass the edges of it, but in doing so it acts upon "that surface of the mercury in the annular space formed "between the outer cylinder and that attached to the piston, "causing a depression of the mercury in that space and a rise of "it on the other surface of the flange or cylinder attached to the "piston to an extent dependent on the pressure of the steam or "other power employed. By these means economy of construc-"tion and working are obtained, and engines thus arranged "are particularly applicable to using superheated steam." The invention also relates "to giving motion to the slide valves of "steam and other motive-power engines from the exhaust side of "them, by which the pressure on the part immediately connected "to the valve by the steam or other power employed is removed."

[Printed 4*d*. No Drawings.]

A.D. 1864, November 11.—N° 2803.

CLARK, WILLIAM.—(*A communication from Constant Jouffroy Duméry.*)—This invention relates to means and apparatus for producing motive power, which consist of a steam generator combined with arrangements for employing the power developed by the expansion of the air which passes through the furnace as an auxiliary to the steam power for rendering independently such services, as 1, the introduction and expulsion of the air necessary for combustion, 2 working the feed pumps, 3, operating the mechanical arrangements for feeding and raising the fuel on the furnace grating; 4, effecting the circulation of air and water necessary for the partial combustion of the steam, 5, agitating and producing a circulating flow of water over the heating surfaces in the boiler, and 6, conveying and utilizing the gaseous heat which usually passes off to the chimney. The boiler or generator consists of two vertical cylindrical chambers united by a flue tube surrounded by water space; the largest chamber contains a

central furnace surrounded by water space. The ash-pit underneath the furnace is closed and cold compressed air is introduced through a suitable pipe beneath the furnace bars; the fuel is fed and raised to the level of the fire-bed by mechanical connections with the crank shaft of the auxiliary air engine. The smaller cylindrical section of the boiler contains a group of vertical flue tubes which open into a lower chamber, whence the heated air passes to the engine at a temperature regulated by the passage of the air through tubes surrounded by the boiling water. The water is fed to the small section of the boiler, wherein it is maintained at a higher level than in the furnace section, which is supplied from the other by an overflow pipe. The poker or instrument for stirring or regulating the fire is introduced into the furnace under pressure through a metal sphere contained in a hollow spherical socket, so that it can be moved in any required direction without causing any escape of the gaseous heat. Orifices are provided for inspecting the interior of the apparatus when in operation.

[Printed, 1s. 10d. Drawings.]

A.D. 1864, November 11.—N° 2811.

THURGAR, WALTER CHRISTOPHER and WARD, ROBERT ARTHUR.—This invention relates to developing heat, boiling water, and generating steam by friction. The heat is evolved by the constant rapid revolution of metal wheels in contact with the boiler, or with metal blocks attached thereto. The frictional surfaces may consist of a fixed hollow cone, in which a solid cone is made to rotate. It is not necessary that the rubbing surfaces be metal; wood, compressed cloth, or other substances may be used for the purpose, having regard to wear and tear. When, for example, the invention is applied to locomotives, it is necessary to generate the first frictional heat by auxiliary aid, such as can be supplied by a small engine, manual power, or otherwise. When the power is sufficiently developed, the means used to create the primary movements may be discontinued. Other boilers may be heated in the same way by the power generated in the first, and by their aid, the superabundant power raised therefrom, may be employed for driving machinery, care being taken that feed water be not introduced simultaneously into all the boilers.

[Printed, 8d. Drawings.]

A.D. 1864, November 18.—N° 2888.

PETRIE, JAMES.—This invention, relating to valves for regulating the flow of steam in steam engines, refers 1, to an improvement upon his and William McNaught's piston valves, Letters Patent for which were granted to them and bear date December 27, 1856, No. 3079. As described in their Specification the ring constituting the valve, is made in one piece with the boss which is mounted upon the valve rod. According to the present invention, the ring and the boss form separate portions, but one is so connected loosely to the other, as to permit of the required motion being given to the valve. The spring for expanding the ring, is mounted independent of the valve rod, so that the central position of the latter is not interfered with. This is effected by forming a projection on the packing ring, which is embraced by a fork attached to a boss on the valve rod; where the packing ring is split, it is formed with inclines to receive a block, which is bevelled to correspond therewith; this block is pressed divergently against by another block, which is caused to slide in a parallel direction with the spindle; it is capable of being set up by means of a screw; a hoop spring abutting against internal projections on the ring, is employed to press upon the sliding block. The fork acts as a carrier and causes the ring to rotate when the valve rod is turned. The latter part of the invention is supplementary to the Specification of former Letters Patent granted to this inventor, bearing date February 24th 1858, No. 365. According to this prior invention, the two valves specified are still by him mounted upon the same central line, but the governor, by means of levers, imparts a sliding motion to a rod which passes into the valve case. A modification is shown and described.

[Printed, 2s. Drawings.]

A.D. 1864, November 19.—N° 2891.

PHILLIPS, JOSEPH.—This is an invention of apparatus for the prevention of those accidents with steam boilers which occur in consequence of the water level having sunk too low, or from over pressure of steam. A stone or other float is attached to a lever on a spindle inside the boiler. This spindle passes through a stuffing box to the outside of the boiler, where it carries a second lever, connected by means of a looped link, to the weighted lever of a valve, interposed for closing the passage in a pipe, whic

one end communicates with the water space of the boiler, and at the other with the furnace, opening therein over the fire. When by the falling of the water the float sinks with the surface level, the lever on the spindle end inside the boiler is correspondingly moved, whereby motion is given to the external lever by the partial rotation of the spindle; by these means the looped link is gradually raised until the end of the loop comes in contact with the weighted lever of the valve, which is also raised and the valve thereby opened, when the water by the pressure of steam in the boiler, is driven through the pipe into the furnace, where it is distributed by a plate over the surface of the fire and thereby quenches or extinguishes it. An index on a spindle actuated by the float, exhibits on a graduated scale the level of the water in the boiler. John Knowelden's Specification dated 15th September 1856, No. 2153, is referred to.

[Printed, 10*d*. Drawings.]

A.D. 1864, November 19.—Nº 2893.

STOTT, Abraham Henthorn.—(*Provisional protection only.*) —This invention relating to steam boilers or generators, consists "in the peculiar arrangement and combination of a series of "alternately inclined pipes or tubes communicating and joining "together by 'elbows' or other equivalent joint, and which "are supported and confined above the fire in a furnace, the "flue of which is formed in a serpentine direction between the "rows of pipes by placing the plates or divisions from pipe to "pipe, and leaving apertures at the ends to allow the heat to "pass round the end of the pipe into the next cavity or flue "until it passes finally into the main flue; the water is sup-"plied to the pipes at the commencement of the first or lower "series upon which the heat of the furnace first acts in its ser-"pentine course between the pipes, and the termination of the "last layer or series of pipes is provided with an enlarged tube, "cylinder, or receptacle forming a reserve for the steam generated "in the pipes, and to which an ordinary valve to indicate the "pressure may be attached."

[Printed, 4*d*. No Drawings.]

A.D. 1864, November 22.—Nº 2917.

MORRISON, Robert. — This invention relates to steam *hammers*. The usual arrangement of fixing steam hammers

upon a separate foundation to that which supports the anvil block is dispensed with, and instead thereof, the bases of the hammer frames are secured to projections cast to or bolted upon the anvil block, the base of which is sufficiently extended or enlarged to steady the machine without other foundations. Hard wood is interposed between the frames and the flanges of the block to relieve the bolts from the concussive effects of the blow, which falling upon a solid mass, expends its terminal force within the resisting capabilities of the machine itself, without, as at present, shaking the ground and buildings. The invention also consists in making the cylinders, the cylinder bottoms, and stuffing boxes of steam hammers, in two halves fitted and bolted together; each half is cast with, or may be bolted to one of the side frames; this mode of construction permits of the piston, the piston rod, and hammer head, being in one piece, without the necessity of having separate covers and stuffing boxes in halves, which according to this invention are now cast together with the half of the cylinder and one frame side; suitable flanges are cast round the division of the cylinder and other parts. These flanges are accurately fitted steam-tight and strongly bolted together. Beneath the cylinder, the inside facings of the side frames are formed into guides for the hammer head; these guides are furnished with flanges where they meet, and are there secured to each other by strong bolts. Below the flanges the frames separate to admit between them the anvil block, and afford room for operating on the balls, and a wide base for the hammer to rest upon. This construction of hammer is specially adapted to puddling or shingling iron or steel, although hammers for forging purposes may be made in two pieces as described. The valve gear is of the ordinary description.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, November 22.—N° 2918.

BRISBANE, Thomas Makdougall.—This invention relates to a duplex compound cylinder engine, to be worked by steam or other fluid. Two double cylinders are disposed on the same plane, and fixed together side by side; they are first cast in single cylinders, and fitted with pistons and rods in the usual manner; they are then united in pairs by the bottom flanges, so that the piston rods work rectilineally to and forth at the opposite ends, and are coupled to crank shafts, which are disposed at

right angles therewith on the same plane as the axis of the cylinders; these shafts are supported by and revolve in coupled bearings, formed equidistant from their centres on the ends of two beam levers, which are diposed parallel with and on the same plane as the cylinders and the crank shafts. A main driving shaft, parallel with the crank shafts, passes at right angles through the centre of the levers, which are firmly secured thereon. This main shaft also passes transversely through the cylinders which oscillate thereon, and are suitably formed and transversely bored between the bottom flanges to receive the shaft. Outside the levers, the main shaft rests in side bearings, supported by suitable framework; firmly attached to the inside of the framing, around each side bearing and concentric therewith, is a stationary toothed wheel or ring, into which tooth wheels on the ends of the crank shafts are geared. The steam is supplied to the cylinders through the main shaft, which at each end is provided internally with suitable passages for the supply and exhaust, and the ports are uncovered and closed by the oscillating movements of the cylinders, without any operating valve gear. When the steam is turned on, the cranks by revolving cause the cylinders to oscillate, at the same time that the toothed wheels on the ends of the crank shafts revolve respectively round the fixed gearing, whereby the whole arrangement is started into rotary action, causing the central main shaft to revolve therewith, whence power is given off for operating windlasses, cranks, and other apparatus on board ship or elsewhere, or for other purposes.

[Printed, 10*d*. Drawing.]

A.D. 1864, November 24.—N° 2940.

VALANT, Louis.—(*Partly a communication from Paul Valant and François Ternois.*)—This invention, relating to apparatus for feeding steam boilers and reservoirs, and for regulating the water level therein, consists of an arrangement of valves and levers, under the influence of a float within the boiler or reservoir, whereby a passage is opened for the admission of feed water to a boiler, or liquid to a vessel, wherein a standing level is maintained by the action of the float, the rod of which is connected to the long end of a lever; the other end of this lever, which is very short, by means of eccentrics or cams acts rectilineally upon the valve rod, which in accordance with the rise and fall of *the float*, correspondingly raises and closes the valve. Another

valve box and valve are interposed between the supply valve and the boiler, for the purpose of preventing the reflux of the water. The apparatus is also shown as applied to a boiler of the horizontal class. An equation demonstratory of the principle upon which the apparatus is based, is included in the Specification.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, November 28.—N° 2960.

GREENHALGH, THOMAS.—This invention relates to steam engines and rotary pumps. It consists, 1, in applying a segmental shaped revolving piston, in an annular space within the main cylinder of a rotary steam engine or rotary pump, which space is formed by a second cylinder or cylindrical shell of lesser diameter, concentrically disposed within the main cylinder; the piston is attached to the plain periphery of this cylindrical shell, which constitutes the broad rim of a wheel with internal gearing; it fills the space longitudinally between the ends of the main cylinder, revolving against or in annular grooves made in the covers. The centre line of the main shaft, which works through stuffing boxes on the covers of the main cylinder, is eccentric thereto, and carries a pinion within the cylindrical shell; a slide, with to-and-fro radial action, is timed in concert with the revolutions of the piston, to enter and form a resistance partition across the annular space each revolution of the piston; the steam admission and exhaust ports open respectively into the annular space on each side of the slide, which by suitable contrivances is, as the piston revolves, withdrawn in time to allow it to pass, converging immediately afterwards to form the necessary resistant to the steam then admitted between it and the piston, which latter, yielding to the pressure, is driven round. Modified details are shown and described. This part of the invention may be used as a rotary pump. 2. Is supplemental to a semi-rotary engine invented and patented by William Martin and Joseph Hodgson, bearing date March 31st, 1864, No. 798. Engine cylinders made according therewith, contain an annular space, wherein two pistons reciprocate a simultaneous semi-rotary action, say from north to south and back to north, one going and returning by the western, and the other by the eastern hemisphere. The present invention consists in casting to the rims of wheels the segmental pistons referred to in the Specification of the said invention,

which wheels are fixed to separate shafts and coupled to the fly-wheel shaft by cranks and rods or by gearing. By the use of these wheels and adjuncts, the reciprocating semi-rotary motions of the pistons are converted into continuous revolutions.

[Printed, 1s. 2d. Drawings.]

A.D. 1864, November 29.—N° 2976. (* *)

WHEATLEY, ARTHUR.—(*Provisional protection only.*)—" Im-" provements in obtaining heat for generating steam in steam " boilers," which consist in " the use of lime " combined with carbonaceous substances as fuel. " When the lime has become " thoroughly ignited, the further supply may be by the lime " alone," which, with a view to economy, may be supplied to the furnace in a heated state direct from a kiln.

[Printed, 4d. No Drawings.]

A.D. 1864, November 30.—N° 2988.

SHAW, EYRE MASSEY.—(*Provisional protection only.*)—This invention, relating to a mode of feeding such boilers as are fitted to steam fire engines and other small steam boilers, to which the invention is more particularly applicable, consists in the employment of a closed vessel disposed above the water level of the boiler. This vessel is provided with a funnel and supply pipe, to which a stop cock is fitted for stopping the communication when the vessel is charged. By means of pipes, the upper part of the vessel communicates with the steam chamber of the boiler, and the lower part of the vessel with the lower part of the boiler; this latter pipe is bent in the form of a syphon to stop the ebullition of the water in the pipe. When the feeding vessel is about to be replenished with water, the two cocks, which communicate respectively with the upper and lower parts, or the steam and water spaces of the boiler (termed the steam cock and the water cock) are first closed. The supply cock is then opened and the vessel filled by pouring the feed water through the funnel; when full, the supply cock is closed and the steam cock opened, and afterwards the water cock. So soon as the rate of the steam pressure in the boiler is established in the upper part of the vessel, the water by the force of its own gravity will begin to descend through the water pipe and run into the boiler, and will continue to do so until the water level therein coincides with the

water level in the vessel; afterwards it will feed as required, until the vessel is exhausted of its watery contents and requires replenishing.

[Printed, 4d. No Drawings.]

A.D. 1864, December 3.—N° 3011.

FRANCE, John.—This invention relates to steam engines. The cylinders or chambers of such engines as are described are not of the usual cylindrical form, but rectangular with pistons of corresponding form; each cylinder or piston chamber has two pistons fitted to an intermediate arrangement for obtaining direct rotary motion. The two piston chambers of a pair of horizontal engines are disposed side by side, sufficient intermediate space being left for the passage by which the exhaust steam escapes. The driving shaft passes transversely direct through the two chambers between the pistons and rests in conical bearings outside. The shaft is furnished inside each piston chamber with an arm, which carries a projecting pin; these pins work in slides which move in vertical slots respectively between the pair of pistons in each chamber, by which means their reciprocating motion imparts rotary motion to the shaft. The steam chest, which contains a circular face valve furnished with radial steam ports passing through it, and central recesses on the inner face for the exhaust, is placed over the centre of the two piston chambers; the periphery of the valve is furnished with bevel teeth, which engage with the teeth of a bevel pinion keyed upon the end of a small shaft or spindle, which enters the steam chest through a stuffing box, and is driven from the main shaft by a pair of spur wheels. The valve spindle, when a reverse of motion is required, is, by means of a hand wheel, moved independently of the main shaft. For working the steam expansively, a cut-off plate valve is provided and mounted on the back of the steam valve; this plate is adjustable by means of a hand lever fixed upon the outside end of the plate spindle, which enters the steam box vertically through a stuffing box on the top.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1864, December 6.—N° 3032.

BLAMPOIL, Alexandre.—This invention relates to smoke consuming apparatus, applicable to locomotive and stationary

boilers. The constitutive principle of the invention, renders smoke incandescent in the midst of flame by the physical combination of vertical and horizontal draughts. These draught currents are produced in the furnace by the transverse disposition therein of two flattened water space tubes of considerable size; underneath, their flattened sides are presented to the fire bed, parallel with and a short distance from the surface of the fire-bars, which incline backwards from the fire door at an angle of 35°. A vertical grating is constructed at the back of the furnace, which confines the back of the fire bed, which there becomes a thick mass of incandescent fuel. The draught through the back grating is regulated by a flap damper outside. The flaming gaseous and fuliginous products of combustion rising up from the centre of the fire bed between the two flattened reverberating tubes, are brought into contact with the horizontal course of the fire draughts, which rise beneath the tubes and from the back of the furnace, there rendered intensely hot by the double draughts through the vertical and horizontal gratings. The fuel is fed on the front end of the grating, the smoke from which is met by the burning draughts from the back of the furnace and immediately consumed. The invention is shown and described as applied to a locomotive and a stationary horizontal boiler, consisting of two tubes, disposed one above the other and united by two short vertical tubular water passages.

[Printed. 8*d*. Drawing.]

A.D. 1864, December 6.—N° 3044.

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only.*)—This invention relates to "obtaining motive power from "aeriform fluids and from liquids." Instead of applying heat to the outside of a vessel containing liquid or fluid, it is proposed to inject into such vessel some substance in a state of fusion; metals may be employed, also combinations of metals with non-metallic elements, such as metallic oxides, carbonates, silicates, and such like substances. Steam for the production of motive power may be generated in a boiler, by the heated products of combustion issuing from the furnace employed to keep such materials in a state of fusion, and steam injected into a vessel containing such heated matter, may be employed to produce power. Fluids contained in vessels, may be alternately heated and cooled for the same purpose, by injecting therein such heated

matter, or passing it through pipes suitably disposed in such vessels, the fluid being driven to-and-fro by a fan, and the refrigeration may be effected by cold currents of air or water, set in motion by a blower or steam blast. The inventor also proposes to utilize the waste heat from steam or air engines, by employing it to evaporate liquids which boil at low temperatures.

Steam for the production of motive power, may be generated by vapour of ether, or volatile liquid driven to and fro through pipes or passages, the heating influence being produced by a current of steam or hot water, and the cooling by cold water or air.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 7.—Nº 3052.

HUSBAND, WILLIAM, and QUICK, JOSEPH, junior.—The objects sought by this invention relating to steam boilers, are the prevention of boiler explosions, and the so strengthening of boilers, as to prevent their being forced out of shape by excessive pressure. With regard to explosions, a fusible plug is used, but not applied or fitted in the ordinary manner; instead of waiting until the plug melts before its advantages are manifested, according to this invention, the plug is not only liable to be melted out by excess of heat, but is also liable to he pulled out or ruptured by the straining of the boiler. This effect is produced inside the boiler by means of a rod or link, one end of which is attached to the plug, and the other end of the rod, which extends across the internal space, is fixed to the shell or other part of the boiler directly opposite. Crank levers or any other convenient device may be used for the purpose. The strengthening of boilers is done internally by the use of stay bars for bracket plates, which are fixed by means of rivets or bolts and nuts with intervening washers, of a material suitable for the purpose, but slow in conducting heat. T-iron or angle iron may be rivetted to the inside of the boiler, to which to attach the strengthening plates or bars, care being taken to leave those parts of the boiler to which the plug rod is fastened, and the part immediately over the fire, wherein the plug is fixed, only in their state of normal strength, in order that they may be the first to bulge or relax, either from over-heating or over-pressure, and so by removing the plug permit the escape of water and steam upon the fire.

[Printed, 10*d*. Drawing.]

A.D. 1864, December 8.—N° 3056.

WILSON, Henry.—This invention relates to apparatus for regulating the flow of, and injecting tallow and other lubricants into steam boilers, cylinders, and steam-tight vessels. The apparatus consists of a steam-tight cylindrical or other formed vessel, which is mounted in a convenient position upon the boiler; inside the vessel is fixed a small force pump, wherein is a hollow piston or plunger, perforated through from face to face with small holes, which are closed when the plunger descends, by a valve underneath the bottom face. The plunger is actuated by a lever handle and connecting rod. The vessel is filled with the lubricant, which is forced by the action of the plunger through a valve in the bottom of the pump, and on into the boiler when a stop cock, which commands the passage pipe leading thereto, is opened. This part of the invention is modified by dispensing with the force pump, and forming respectively a steam tubular connection between the top of the vessel and the steam space of the boiler, and another communication leading from a lower level in the latter to the bottom of the vessel; these passage pipes are commanded by a two-way cock. When put into operation, the vessel is first filled with the lubricant, the tubular connections with the boiler being closed; when full the supply passage is closed, and the two-way cock opened; the steam enters the vessel above the surface of the lubricant, and so soon as the steam pressure in the vessel is equal to the pressure in the boiler, the lubricant begins to flow into the boiler through the other way in the cock. The apparatus for lubricating cylinders, consists of a cylindrical vessel fixed on the steam pipe leading from the boiler to the engine. When filled with the lubricant, the feeding valve or cock on the top of the vessel is closed; a cock at the bottom of the vessel is then opened, and by means of an internal tube attached thereto, the steam is conveyed to the upper part of the vessel and condenses, sinking below the lubricant, which swims on the surface. As the water of condensation accumulates, the level of the lubricant is raised so high in the vessel as to be able to flow out, through a triple-way regulator cock, into the steam pipe, where it mingles with and is carried into the cylinder with the steam. Other modifications are shown, and also an adaptation of the apparatus to the boiler of locomotive engine.

[Printed, 10*d*. Drawing.]

A.D. 1864, December 8.—N° 3060.

CROCKFORD, CHARLES.—This invention, relating to "traction "on railways, more especially adapted to steep gradients," consists in the use of auxiliary lines of rails raised above the level of the ordinary rails, and of auxiliar driving wheels smaller in diameter than the ordinary driving wheels of the engine, and grooved round the periphery to run on the auxiliary rails, the arrangements differing according to the construction of the engine. In the case of an engine with inside cylinders, an ordinary crank shaft and outside driving wheels, the auxiliar wheels are either fixed on the ends of the crank axle, outside the ordinary driving wheels, or the rims of the latter are made much wider and of two diameters, the outside or smallest being deeply grooved to run on the auxiliary rails, which impinge on the slanting sides of the grooves. When the invention is adapted to an engine having outside cylinders and connecting rods, one middle rail and one broad auxiliar wheel fixed mid-length upon the driving axle, is employed, the wheel having several grooves, and the rail being fashioned lineally with angular ridges to correspond. When rounding curves, the outside auxiliary rail may be suppressed, the engine then running on the line of the outside curve upon its ordinary driving wheel, and upon the inside line of the curve with an auxiliar wheel upon the auxiliary rail, and when running up inclines the engine takes to the auxiliary rails and obtains additional power in proportion to the reduced diameter of the auxiliar driving wheels.

[Printed, 6*d*. Drawing.]

A.D. 1864, December 16.—N° 3114.

GEDGE, WILLIAM EDWARD.—(*A communication from Arthur de Montméja.*)—This invention relates to steam engines, and consists in a particular mode of distributing the steam, and of an independent reversing apparatus, showing its application to engines with fixed or oscillating cylinders. As regards the distribution of steam to the cylinder of an engine which oscillates on trunnions, one of which extends considerably beyond its bearing and contains a conical cavity tapering inwards from the end of the trunnion to receive a key, which in form is similar to a truncated cone; on opposite sides, about the mid-length of the key, are sunk two transverse parallel grooves, leaving the centre

uniform in thickness from side to side, where sufficient surface is left to cover the steam ways; the steam arrives from the boiler through a pipe attached to the conical barrel of a four-way cock, which contains a key or plug similar to that already described; with this key the reversing action is accomplished; the four ways or transverse passages in the conical barrel are pierced diametrally through and would intersect the centre at right angles; the way opposite the steam entrance is open to the atmosphere; externally to each side way is fitted a pipe, which pipes according to the position of the plug act respectively, in relation to the direction of motion, either as induction or exhaust passages to and from the cylinder; the other ends of these pipes are attached to and communicate, through passages pierced in the end of the truncated conical distributing key, with the chambers formed thereby inside the trunnion. The key is immovable, but as the cylinder oscillates, the lateral steam ways, which communicate through the trunnion respectively through pipes connected with the ends of the cylinder, are by its vibratory motions brought alternately into coincidence with the supply and exhaust. These arrangements of valves are adaptable to double cylinder engines of the oscillating class, which are fitted with a steam cock common to both. Three detailed modes of applying the invention to engines with fixed cylinders are shown and described, and in connection with its general application, it is proposed to operate the feed cock, which is interposed between the pump and the boiler, by connections with the boiler float, so that whenever the supply of water to the boiler is in excess, such water may be automatically returned to the reservoir. The specification includes a mechanical arrangement for operating the slide rod of reversing gear, and also an arrangement for producing variable expansion in connection with the invention, which is effected by the use of a central cone with adequate steam ways concentrically fitted into the truncated key.

[Printed, 1s. Drawings.]

A.D. 1864, December 17.—N° 3128.

SALMON, PETER.—(*Provisional protection not allowed.*)—This invention relates to railway rolling stock, traction engines, and carriages for common roads. In reference to steam boilers, it consists 1st. In constructing Cornish boilers with vertical superheating tubes in the flues. 2nd. Adapting locomotive, or other

boilers of stronger make, as superheators of steam received from stationary boilers. 3rd. Attaching air pumps and condensing apparatus to locomotives. 4th. Relates to a composition which is placed in a bag suspended in the boiler beneath the water level. 5th. Feed water supplying to steam boilers by means of an apparatus worked by electricity.

With regard to carriages and trucks:—1st. Adapting to them steam generators or "expanders" heated by the lamps used to light such conveyances, and using iron or steel in their construction. 2nd. Applying a system of brakes throughout the train, and working them simultaneously by electricity. The wheels have flanges for both sides the rails, and resting in oscillating bearings, have solid or hollow steel axles, whereon the carriages, which have upper and lower compartments, are mounted on vertical steel or india-rubber springs; other details of construction are described.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 17.—N° 3131. (* *)

COCHRANE, Arthur Auckland Leopold Pedro. — (*Provisional protection only.*)—" Improvements in apparatus for heat-" ing and evaporating liquids and fluids," which consist in the use of a furnace without an ash-pit, and in which "the fuel may " be of any vertical height the crown of the furnace will" allow. The fuel rests on a solid or close bottom and "in immediate con-" tact with the water spaces of the boiler or the sides of the " furnace," and air to support the combustion of the fuel is forced in through holes at the sides of the furnace by mechanical means.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 17.—N° 3139.

DAVEY, Henry.—(*Provisional protection only.*)—This invention relates to steam engines. 1, to a particular arrangement of valves. The valve face is circular with two quadrantal openings for each cylinder, one for the induction of the steam and the other for the exhaust; a circular valve with corresponding openings is concentrically placed upon the valve face, and is caused to revolve by any convenient means, its revolutions being equably timed with the revolutions of the crank shaft, so that the openings in the valve are alternately brought into coincidence with the induction and exhaust: when required to work expansively, another revolving circular valve, adjustable by convenient means so as to

revolve in advance, is placed concentrically on the back of the main valve with a stationary plate interposed; this plate is provided with corresponding quadrantal openings. The valves are loose upon the spindle which moves them; they are carried round by a driver attached thereto. The reversing of the engine is effected by simply pulling the spindle round half a revolution which is done by means of a wheel fixed thereon. A modification is described wherein by causing the openings in the main valve to expand, the top valve is dispensed with. 2, consists in forming the condenser with a cold water chamber at top, whence the water descends into the condenser in the form of a shower through perforations in the bottom of the chamber, which is supplied with water by one action of the air pump; suitable valves are provided. 3, relates to removing pressure from the back of slide valves: these valves are made with two facings, and in transverse section are somewhat like the double-beat valve. 4, relates to steam engine reversing gear.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 19.—N° 3148.

BROOMAN, Richard Archibald.—(*A communication from Felix Alexandre Testud de Beauregard.*) — *Provisional protection only.*)—This invention relates to the construction of furnaces, in which the arrangements are such, that the gases evolved by the burning fuel in the lower part of the furnace are conducted through a series of burners in the upper part of the furnace, where, being oxygenated by combination with air or steam and thereby rendered inflammable, they are burnt beneath the bottom of the boiler. These results are to be obtained by fitting in the upper part of the furnace chamber two plates of metal or refractory material, so placed one above the other that an interspace is left between them of sufficient size to admit the required amount of air or steam. The lower plate is perforated with holes, and in each hole is fixed a gas burner. The upper plate is also correspondly perforated, but with holes five times larger than the holes in the bottom plate. "The top of the upper plate should be "concave to form a parabolic mirror, and its surface polished to "reflect the heat." To each burner may be fitted a platinum ring to prevent the escape of unconsumed gas, and the plates may, for the purpose of keeping them cool, be furnished with hollow ribs for the passage of currents of cold air. The bed of fuel rests

and burns upon a plate at the bottom of the furnace, and heats water in a tank beneath. There are three openings into the furnace beneath the level of the perforated plates; the uppermost for feeding in the fuel, the next below for admitting air, or steam, and the lowest for the removal of scoria; these openings are closed with doors. The gaseous products evolved by the fuel and mingled with the air or steam, pass upwards through the burners and are inflamed, burning in separate jets surrounded by the air which enters between the plates, and which is brought so intimately into contact with each jet by means of the holes in the upper plate, as to render the combustion as nearly as possible complete.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 19.—N° 3152.

KING, Henry James Hogg, SMITH, Hubert Ellis, and HOWELL, Joseph Bennett.—This invention relates to the slide valves of steam engines and to the apparatus for operating them. It consists 1, in a particular construction of a double slide valve, whereby, although the steam be admitted during the whole length of the stroke or be cut off at a quarter of the stroke or even less, the eduction remains open in both cases, and the objectionable back pressure resulting from the use of one slide is obviated. The valve consists of one valve within another or main valve, which is actuated in the ordinary way; both valves work on the valve face; the inner valve covers internally one steam port and the eduction port; it is disposed in a cavity formed in the face of the main valve, fitting sideways to slide therein, but being much shorter has longitudinal liberty to traverse. The thickness together of the ends of the two valves is a little in excess of the width of the port. When steam is first admitted to the cylinder, it, by getting under and between the contiguous ends of the valves, which are slightly bevelled, forces the inner valve to the opposite end of the cavity, thereby at once and during the whole length of the stroke, placing the other steam port in communication with the exhaust. This part of the invention is modified. 2, relates to apparatus for moving the eccentric or crank pin, whereby the slide valve of a steam engine is operated, so as to be able to increase or lessen its throw, and thereby correspondingly lengthen or shorten the traverse of the valve; and also to cause the reversal of the engine, by traversing the crank pin or the centre of the eccentric across the end of the main

shaft. A dovetailed slide, to which the crank pin or eccentric is fixed, is moved in a suitable guide by means of a disc placed loosely upon the shaft; on the face of the disc there is a volute groove by which the slide is actuated when the disc is turned to effect the required change. The crank pin can be so adjusted as to cause the slide valve to cut off and work more or less expansively. The disc may be operated by the governor. 3, relates to a modification of the latter part of the invention.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1864, December 21.—N° 3169.

HENRY, MICHAEL.—(*A communication from Léon Foucault.*)—This invention relates to centrifugal governors and is supplementary to an invention patented by William Clark as communicated to him by the above Léon Foucault; the said patent bears date 30th December 1862, No. 2479, and consists in combining all necessary conditions for obtaining isochronic action. The object of the present invention is to show dynamically and theoretically the principles of construction, the reasoning on which the inventor proceeds, and the arrangements necessary for carrying the invention into practical effect; the starting point being the normal governor, in which the two arms are suspended from a single point on the axis, and jointed to the centre of a sliding ring by connecting rods of half the length of the arms. As the governor revolves the arms ncline at a varying angle which, with the duration of revolution is expressed in the specification by certain formulae, to which the reader is referred. "To a governor of "any required length any desired velocity of revolution with "isochronic action may be communicated by combining with it a "counter-balance weight which has an accelerated velocity of "descent uniformly with the height of the mass in motion." Various arrangements of construction on the principles described may be adopted, but preference is given to the most simple and least complicated. Numerous examples of governors are described, in which only levers or jointed connecting rods are employed to transmit the action of the compensating counter-balance weight, or of the compensating springs which are sometimes employed instead of the weights. These governors which vary in details, consist of a combined governor, a spring governor, spring and counter-balance weight governor, inlet valve arrangements, clockwork governors, vane and spring governors, wing and counter

balance governor, friction governors, and spring and independent vane governors.

[Printed, 2s. 4d. Drawings.]

A.D. 1864, December 21.—N° 3171.

RAMSBOTTOM, JOHN, and BLACKBURN, THOMAS.—This invention relates to hydraulic, steam, and other motive-power engines for general use, and for compressing and measuring fluids. The piston rods of two oscillating cylinders, mounted diagonally or at right angles to each other upon suitable trunnion bearings, are coupled to and give motion to a crank shaft, which resting in the side frames is superposed above the cylinders. A pulley fixed on the end of the crank shaft outside the framing, gives off the power by means of a strap. The fluid is admitted to a chamber in one of the trunnion bearings of each cylinder, and finds its way into the cylinders as during their reciprocating oscillations the ports or openings in the bearings are brought into coincidence with corresponding ports in the trunnions, the exhaust taking place in the same way. An additional valve is required for reversing when the engine is employed for hoisting goods or materials, and an additional crank, when a pump for compressing air or discharging water is combined therewith.

Various modifications are shown and described, including a steam force pump with indicating apparatus; a single cylinder engine working within a closed vessel, adaptable as a steam engine, or if driven by other motive power, as a pump, the centre of oscillation and valve being at the end of the cylinder; a steam and water engine adapted for hoisting and similar work, requiring the motion of the engine to be frequently reversed: and a form of engine adapted for working as a metre, or for giving off power, the support for the crank shaft being situated between the cylinders.

[Printed, 1s. Drawing.]

A.D. 1864, December 22.—N° 3182.

BYRNE, JAMES.—This invention relates to an adjustive ball governor, applicable to motive-power engines and machinery. The centrifugal force of the balls at the extremities of the revolving pendulous arms, is counter-balanced at any required speed by the gravity of an adjustable counter-weight, or the tension of a spring. Any suitable number of pendulous balls may be used,

but four is the number preferred. Each pendulous arm is shaped and constitutes part of a bell-cranked lever, formed with arms of unequal length; they are attached to the spindle on fixed centres or fulcrums, in mortices formed on the spindle at right angles with each other, in an enlargement thereon; both ends of the levers are free, the longest hang down through radiating curved guides and carry the balls; the shorter ends are connected by links to a sliding cylinder upon the upper part of the spindle, which at that part is hexagonally shaped, with which the internal form of the cylinder corresponds, so that it has liberty to slide up and down the spindle, but cannot revolve thereon. The top of the sliding cylinder is furnished with a steel hollow centre to receive the lower steel pointed end of a vertical bar, the top of which is united by a link to the valve lever. One end of the counterweight lever is also fixed upon the valve spindle at a suitable angle, the other end is free and carries the weight which, by sliding can be adjusted and fixed by a set screw to regulate the required speed.

[Printed, 1*s*. Drawings.]

A.D. 1864, December 24.—N° 3205.

NEWTON, ALFRED VINCENT.—(*A communication from Richard Lavery and Sinclair Stuart.*)—This invention relating to means for stopping leakages in boiler tubes, consists of a split ring of cast iron to be used either with or without a bead at its end. When a tube leaks in any part of its length away from the ends, a plain split ring is placed inside the tube, so as to cover the leaky place and then, by means of a wedge or wedges driven between the edges of the split, the ring is caused to expand and press outways against the interior of the tube and so cover and stop the leak without materially interfering with the draught space through the tube. When applied towards the end of a tube near to the tube sheet, the ring is furnished with a bead which fits into the cavity of the tube close behind the tube sheet; the wedges are then driven in, whereby as explained above, the ring is expanded and the leak is stopped. An open cap of cast iron may be connected by screw bolts secured inside the ring to projecting ears or lugs or otherwise, then by interposing suitable packing between the ring and the tube, the leak will be stopped by the expanding action of the wedges without much interfering with the draught.

The cap can be secured in its place without boring holes in the tube sheet.

[Printed, 8*d*. Drawing.]

A.D. 1864, December 28.—N° 3223.

BLANCHET, Aristide Paul.—(*Provisional protection only.*)—This invention relates to steam culture, and consists of a steam locomotive, which will actuate all kinds of agricultural implements, especially ploughs and tilling machines; it comprises 1, a strong iron framing which supports the entire arrangement; 2, a boiler of 10 horse power with two engine cylinders placed incliningly on each side respectively of the fire-box. 3, a crank shaft which is actuated by the pistons and their connecting rods; on this shaft are loosely mounted three chain pinions, which are caused to revolve when made fast by clutches. 4, two large iron hind wheels with broad felloes, and two of smaller dimensions in front. Mid-length upon the axle of the hind wheels is fixed a chain wheel, embraced by an endless chain, which passes round the centre chain pinion on the crank shaft, thereby giving motion to the main axle and driving wheels; the latter are arranged to act either together or separately, and when the engine is not required to travel, are thrown out of gear. The centre of the fore axle is pivotted to the framing for the purpose of steering, which is effected by apparatus manœuvered by means of a winch under the control of the engineer, whereby the wheels are turned in the required direction. 5, consists in placing a winding drum mounted upon a transverse shaft, towards the back of the machine supported by the back framing; a chain wheel is fixed on each end of the drum shaft, which, by means of endless chains which embrace the two chain wheels thereon and the two outer chain pinions on the crank shaft, is set in motion and rotates the drum, whereon is wound a wire rope the free end of which is fixed to the plough or other cultivating implement. 6, As the onward progress of the implement and of the engine alternate, a propping apparatus is attached to the after part of the framing. When the engine is moving forward the drum shaft is free, and the rope is unwound by the backward drag of the implement until a sufficient length is paid out; by means of the clutches the driving wheels are then thrown out of gear, whereby the further advance of the engine is stopped and the drum shaft is then thrown into gear by the respective movements of the

pinion clutches; the drum then begins to revolve, and wind on the rope, whereby the implement is again drawn towards the engine, operating in its course upon the land. The regression of the engine in consequence of the strain upon the rope is prevented by the trailing props. Feed pumps, water tank and fuel bunker, are conveniently arranged, as also the attachment to the boiler of two water gauges, safety valve and steam whistle. The ploughs or other implements are diagonally arranged and fixed to the underside of a strong framing, which is carried on wheels. The side pieces extend forward and form the sides of a fore frame, whereon there is a windlass, and opposite each plough a seat for the ploughman, who by apparatus suitably arranged can, by the aid of levers when necessary, raise the ploughs or implements out of the ground.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 29.—N° 3232.

MILLAR, James.—This invention relates to locomotive and partly to other engines. It consists of several distinct detailed arrangements. In order to bring the largest portion of the weight of a locomotive engine to bear upon the crank axle of the driving wheels, the cylinders are placed as contiguous as possible thereto; the piston rods work out towards the back of the engine and act upon the crank axle by means of return connecting rods. There may be two cylinders on each side with the connecting rod in each case working between them, and one steam box and an equilibrium slide valve be made to serve between the valve surfaces for both cylinders, or if only one cylinder be used, the connecting rod may be forked. The invention also consists in arranging the connections between the valve motion link and the valve rod, so as to compensate for wear. To the valve rod is fixed a frame, which works in guides; blocks arranged to swivel and adapt themselves to the changing positions of the link, by bearing on its opposite sides, are fitted to the frame and can be set up when worn, by screws or wedges, or (according to a modification) the link or the block may be made in adjustable halves. It also consists in applying in addition to the ordinary bearings of the crank axle, vertical brasses to receive the horizontal backward and forward thrust of the connecting rods; these brasses may be set up by wedges: in general for want of space about the axle, it will be found most convenient to

apply the brasses to the bosses of the wheels. It also consists in fitting across the fire-box of a locomotive boiler, a horizontal or an inclining water space traversed by tubes for the upward passage of the flaming gases, whereby, amongst other advantages, additional heating surface is obtained, and the too direct escape of the gases prevented; two fire-doors are provided one above the other. The invention consists lastly, in cleaning or scraping railway rails for the passage of the engine, by fixing rotary brushes or scrapers in advance of the driving wheels, to be lowered and used as occasion requires.

[Printed, 10*d*. Drawing.]

A.D. 1864, December 29.—N° 3234.

TRUSWELL, JOSEPH, and TRUSWELL, WILLIAM.—(*Provisional protection only.*)—This invention for indicating the water level in steam boilers, consists of a float "composed of two parts, " namely, a heavy brick tile, and a hollow inverted vessel placed " above it, both being fixed to the same rod. The latter is in the " form of a shallow inverted vessel, rather less than the tile, being " open beneath and having a small space all round between its " lower edges and the upper surface of the tile to admit steam into " the vessel. The weight of this float is about" 72 lbs. "against " a counterbalance weight of only " 50 lbs. " outside the boiler. " The action of the float is as follows:—When the level of the " water in the boiler falls, it will be evident that the superior " weight (twenty-two pounds) of the float will cause it to sink " also, and by raising the counterbalance weight will indicate " danger; but as soon as the level of the water begins to rise it " closes the aperture all round between the tile and the upper " vessel, and the steam contained in the latter renders it buoyant, " and thus counteracting the superior weight of the float compels " it to rise with the ascending level of the water and allow the " counterbalance weight outside the boiler to fall, and thus the " rising and falling level of the water in the boiler will at all " times be indicated with unerring accuracy."

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 29.—N° 3239.

NALDER, WILLIAM, and BELCHER, ALFRED.—This invention, relating to steam engines and boilers, and to parts of machi-

nery, consists, 1, In arranging an exhaust port to open into the steam engine cylinder at the side, midway between its two ends. This cylinder is unusually long in relation to the length of stroke; the piston from face to face occupies nearly one half the cylinder, and covers the exhaust port excepting towards the termination of a stroke, when the ends of the piston alternately pass beyond and allow the exhaust to take place. 2. Relates to a regulating governor applicable to all kinds of steam engines. The governor balls are connected by links to a sliding collar on the governor spindle, or they may be disposed on the crank shaft of a small engine: the centripetal reaction of the balls is obtained from two flat springs, which are connected at one end to a fixed collar on the spindle or shaft, and at the other end respectively to the governor balls. The spindle or shaft may be horizontal or at an angle or otherwise. The valve, which is operated by the governor, slides upon the back of the ordinary sliding stop-valve or regulator. The governor has the same controlling power at every position of the stop valve, and is enabled completely to cut off the steam in case the load upon the engine be suddenly removed. 3. Consists in elongating the stop cock for the suction pipe of the feed pump, in order to form the seat for the lift valve, which is situated on the side of the plug farthest from the suction pipe; one clack box with its fittings is dispensed with, and, in vertical pumps, the valve, water passage, and plunger are disposed in a right line. 4. Consists in gradually hammering down or flattening on opposite sides, a portion of the length of the pump and valve rods, in order to impart to them a degree of flexibility, whereby joints are dispensed with; these rods may be fixed at both ends respectively to the pump piston or valve and to the eccentric ring. 5. Making the fulcrum of the valve lever knife edged, to bear against the lower inner surface of a hollow boss formed on the valve end of the lever. The lever constitutes a spring, its free end is connected to a rod, which passes through a guide; the lower end of the rod is screw-threaded and carries a hand nut: the rod is furnished with a graduated scale, and the lever can be loaded to resist up to the required pressure, by being drawn down by the nut, until the corresponding figures on the scale are level with the top of the guide. 6. Consists in lubricating crank and other bearings from a chamber, formed in the brass of the bearing to contain the lubricant; an annular groove is made in the bearing, wherein is loosely placed a ring, which

loosely embraces the shaft and is caused to revolve thereby, and so take up and distribute the lubricating fluid, which flows back to the chamber when the shaft is at rest.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, December 30.—N° 3247.

COUPRANT, Edmond.—(*Provisional protection only.*)—This invention relates to "a new rotative power," stated to be of general application. It is proposed "to erect standards on a bed plate "or foundation in order to support in bearings the axle of a "driving wheel, on the circumference of which at equi-distant "points four small grooved pulley wheels are set, the peri-"pheries of which project beyond that of the driving wheel. "The surface of the foundation of the machine is made of the "form of an arc of a circle taken from the centre of the driving "wheel, so as to leave room for the rotation of the four grooved "pullies. Between the pullies and foundation a flexible but non-"elastic tube of fibrous or other suitable steam and water-tight "nature is placed, having flanged metal terminations at each end; "and communications are established at each end with the steam "boiler, and with an exhaust or condenser, so that by allowing "steam to enter the tube at either end, its pressure will force open "or fill the tube and drive the grooved pullies forward and round "in regular succession, and thus carry the main wheel and axle "with them, and by this means drive machinery or paddle wheel "and propeller shafts by ordinary gearing used for such pur-"poses. Of course the direction of the rotation depends upon "the traverse of the steam through the tube; by reversing the "passage of the steam through the tube, the pressure on the "grooved wheels is reversed, and consequently the driving wheel "and shaft are also reversed." Hydrostatic power may be applied to work the machine.

[Printed, 4d. No Drawings.]

A.D. 1864, December 31.—N° 3255.

ROGER, Paul André.—This invention, relating to the consumption of smoke, is adapted to steam boiler and other furnaces, and also to furnaces employed for the desulphuration of ores. It consists of an apparatus for distilling and distributing the fuel, so as to deprive it of its gases and smoke before it is transferred to

the fire. This apparatus is placed inside the front of the furnace above the level of the furnace door, and is fed from the shoot of a hopper which extends into the furnace. It consists of a chambered wheel, constructed upon a horizontal central spindle, to which occasional rotary motion is imparted by hand or otherwise. The sides of this wheel are formed by two plain discs of sheet metal concentrically placed apart on the spindle, so as to leave an interspace of some breadth. This space is divided by radial partitions, into segmental chambers open at the circumference. As the wheel is rotated, the empty chambers are in succession filled from the hopper, and carried forward at intervals into the front of the furnace, where distillation takes place, the gases and smoke evolved being brought into contact with the burning heat from the fire-bed, and consumed as they pass over it. The fire-bed is raised by the aid of suitably shaped blades, which are radiatingly attached to revolving shafts, transversely disposed in the ash-pit. These shafts are caused to rotate by means of a worm and worm-wheel, the blades suitably curved, when rising between the fire-bars break up the fuel and open passages for the air. The spent fuel is gradually carried to the far end of the furnace, and the cinerary residue falls into a closed chamber beneath the bridge.

For desulphurating ores, two cones conically fixed one within the other a short distance apart, are employed. These cones are fixed in front of the ash-pit, which is otherwise closed. A central passage, which terminates at the apex of the inner cone, admits a jet of steam, which blows out direct through the apex of the outer cone into the ash-pit. The impulsive force of this jet of steam induces or draws in a current of air through the open space between the cones, which air mingles with the steam and is carried into the ash-pit. The steam is decomposed by the heat and supplies oxygen for accelerating combustion, and hydrogen for decomposing the metallic sulphuret, forming a volatile sulphuret of hydrogen, which passes off through the throat of the furnace.

[Printed, 8*d*. Drawing.]